Supporting Debates with a Real-Time Feedback System

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Abstract
Feedback systems can improve collaborative working and learning. We investigate a novel real-time feedback system that enables a subtle and unobtrusive interaction between learners and trainers in the context of debates. Novices to structured debates practiced in debate clubs need to learn fundamental rhetorical skills. The argumentation follows a well-defined structure: *claim*, *explanation* and *example*. Learners receive feedback about their rhetorical performance in the end of debates which complicates the immediate adaptation. We introduce a real-time feedback system enabling an unobtrusive teacher-student dialog. Teachers virtually communicate their assessment about the presented performance using a smart phone; students adapt the structure of their debate according to the visual feedback that is presented on a tablet. We tested our prototype in the field and applied it to two debates. We found that participants that used our feedback system valued the immediate feedback and stated high satisfaction about their own performance.

Author Keywords
Feedback system; visual feedback; debate; debating society; argumentation

Figure 1. One jury member provides feedback to the speaker's tablet via smartphone.

British Parliamentary Style Debate [4]

Four fractions, the opening government, the opening opposition, the closing government and the closing opposition, each including two members (hence eight in total) take part in a debate.

Speakers have 15 minutes to prepare their arguments and then present these arguments (notes are allowed) starting with the first speaker from the government.

Argument Structure

- Claim
- Explanation
- Example

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

Feedback is an important aspect of interaction between humans. Humans adapt behavior and learn from feedback by others. There are different feedback types that can influence the effectiveness of feedback [5]. Narciss and Huth distinguish the three main parts of feedback *content*, *presentation* and *function* [9]. The field of human-computer interaction brought up various approaches to support the presentation of feedback, when human-human interaction is limited. We will refer to these tools as *feedback systems*.

Feedback systems are applied for a variety of different tasks in remote and co-located environments. There is a large number of tools that support argumentation [10]. DREW for instance is a web-based system that integrates a graph editor with a chat tool to support argumentation [2]. Stegmann et al. [12] used collaboration scripts to support a high quality of argumentation in online discussions. These systems all focus on support for remote debates. Our work differs by visualizing argumentation structure of oral speech in a co-located environment in real-time.

Feedback tools were studied extensively for use in oral presentations. *HaNs* [13] is a haptic feedback system that communicates speaking times. PowerPoint [8] also provides visual feedback on the presenter's view. Kurihara et al. [7] studied viewing directions analyzed via computer vision which is directly communicated to the speaker. They also used audio cues to give feedback about speaking rates, without considering the content spoken. However, all of these systems have not been examined with content-oriented feedback.

In debates, argumentation is a fundamental skill. One debate is the British Parliamentary Style Debate, which is common in debate clubs and debate competitions. These clubs train rhetorical and communicational skills. A jury provides feedback after each debate about different criteria such as expertise, linguistic power and reasoning power. This feedback should help the speaker improve her skill in the next debate. This process does not make use of immediate feedback about a speaker's performance. We aim at enabling real-time feedback during a debate, to allow further support from jury to speakers and shorten the feedback-loop.

Our goal is to support debate learners by providing real-time feedback from the jury to the current speaker, as shown in Figure 1. We aim at investigating how complex feedback can be communicated during a debate in order to enable a feedback-loop during speech. Because beginners are mainly having trouble in presenting their arguments in a well-structured manner [6], we developed a system that conveys information about the speaker's argumentation structure. The intention of the feedback system is to allow for faster and better learning of structuring and presenting arguments to an audience.

Argumentation Visualization

A design opportunity for supporting debate speakers is that debates have a more defined structure than most other talks. First, argumentation should follow a clear structure and speakers need to clearly identify the structure of their talk. For instance, arguments should

clearly show the three elements *claim, explanation* and *example*. This is a common structure of arguments in debates, albeit others exist (e.g. [14]) that could also be used. We chose these three categories for a first design, by capturing how the speaker performs in each category and visualizing current performance to the speaker. An extension to more sophisticated aspects of speaker performance is possible. Second, only the jury evaluates the speaker in debate learning. Letting *the jury* provide the feedback aligns naturally with the debate style. So, our design is based on visualizing performance in the categories *claim, explanation* and *example*, and to collect the evaluation data from a jury member in real time.

System Design

The feedback system is a web-based interface for providing and visualizing debate feedback. Powered by the structure of a debate, the system provides an interface for the jury to give feedback and a second interface for the speaker that visualizes the feedback. Both interfaces are implemented using HTML5, CSS3, JavaScript and PHP. We used our own debate experience and input from jury and speakers for our first prototype design. The jury interface (Figure 2b) allows jurors to give feedback and make their regular notes at the same time. It consists of four buttons, mirroring the three categories of argumentation and a button *new argument* that moves the current argument to the history and displays a new argument. The button layout is adapted for smartphone usage.

The speaker interface (Figure 2a) allows the speaker to get an overview about his argumentation performance. It consists of the current argument structure and an argument history of all past arguments. The argument

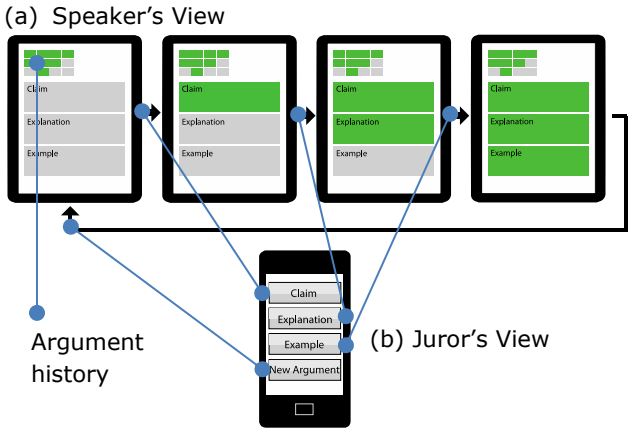

Figure 2. Feedback system components: (a) Feedback loop of the speaker's tablet view. The green and grey matrix at the top shows the argument history. (b) Feedback system for the jury. The three upper buttons activate the corresponding field of the speakers view. With the lower button, the jury can regard the argument as finished.

structure is first all grey and when an argument element is sufficiently fulfilled, it turns to green. The layout is adapted to usage on a tablet screen. The two interfaces communicate through a webserver. The setup requires one tablet and one smartphone connected with the internet.

Preliminary Study

We conducted a preliminary field study to see if the feedback supports the building of arguments in a debate without disturbing the speaker. In the long term, we want to compare different complexity levels of feedback and evaluate the learning experience with such a feedback system. This first study compared the feedback system against a baseline, where feedback is

Figure 3. Examples of how the system was used. (a) Example of a gaze on the desk with notes and feedback system (red circle). (b) Example interaction between speaker and audience.

given only after the debate. We thereby extend existing research on feedback systems to real- time qualitative feedback for structured tasks such as debates.

We hypothesize the following:

H1: Speakers can understand and apply the input from the feedback system in real-time.
H2: The feedback system does not distract from the primary task.

Participants and Design
8 speakers and one juror took part in each debate. 4 participants took part in both debates. The other 4 speakers were different in each of the two debates, thus 12 speakers took part in the study in total (average age 23.5, 10 male); all were members of the Munich debate club [3]. Thus, we conducted the study as a within-subjects design with 4 participants. Conditions were counterbalanced for these 4 participants. The other participants used the system only once and provided qualitative feedback about their experience with the system. 7 participants were novices (<10 debates), 3 debated for a longer time (20-60 debates) and two of them already took part in over 100 debates.

Procedure
Two British Parliamentary style debates were conducted with one week in between. Both debates took 120 minutes and were followed by 20 minutes questionnaire filling and a semi-structured interview. The topic of the first debate was "This house would send the prodigal son back", the topic of the second debate was "This house would forbid pornography." Both topics are common debate topics and were chosen by the debate club.

The feedback system was positioned at the speaker's desk (Figure 3). Speakers with feedback systems were briefly introduced to the system and were asked to directly use the feedback during speech. The jury was asked to use the buttons on the screen when they think the argument element has been presented sufficiently.

Measurements
The comparison used the measures of gaze direction and reported self-efficacy [1, 11]. We used video recordings to evaluate the gaze directions of the speakers. After the debate, questionnaires with 5-point-Likert scales were handed out and semi-structured interviews were conducted. In the questionnaires and the interview, speakers were asked to rate themselves, evaluate the design of the system and state, how useful they found feedback during the debate.

Results
The measured effects for feedback-supported speakers can be seen in Figure 4. 60% of the speakers valued the separation into claim, explanation and example (Mdn = 4). However, participants differed in their opinion, if the feedback system simplifies the learning of argumentation (Mdn = 3).

We used video observations to see whether visual feedback would be disturbing during the talk. All participants used notes (lying on the table or holding them in their hands). The average amount of gazes of the speakers on the desk was 21 with feedback system and 20 without. Most of the gazes endured below one second. This indicates that feedback additionally to notes was not more distracting than only notes (H2).

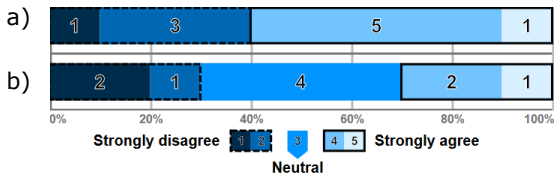

Figure 4. Answers on Five-Point-Likert-Scales to the Questions: (a) *"The separation into claim, explanation, example was useful."* (*Median = 4*) b) *"The feedback system simplifies learning argumentation."* (*Median = 3*)

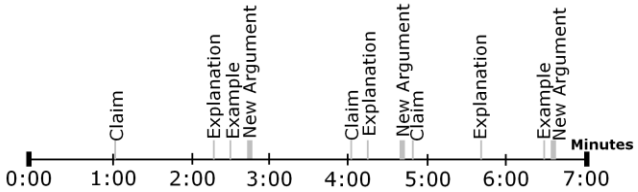

Figure 5. Typical progress of feedback during one speech.

The qualitative analysis shows that participants were positive regarding in-debate feedback for debate support. Participants regarded the system as a useful tool to receive immediate feedback. All participants agreed that a simple representation of their argumentation was helpful. Participants were positive about the ability of receiving feedback during the talk: *"When all three parts are green, I receive an extra push, like a reward system." (P5)*

Participants also mention that direct feedback would be useful instead of just receiving it after the talk: *"Real-time feedback allows for direct improvement." (P4)*

Nevertheless, feedback was also rated as *"sometimes distracting" (P3)* and *"too inflexible" (P4).* Expert speakers confirm that the system is more appropriate for novices than for experts.

Jurors were able to follow the debate using our system most of the time. However, jurors mentioned difficulties in deciding when to click a button, in case the speaker did not follow the given structure at all. Figure 6 shows an example of a typical progress of feedback during speech. Participants suggested here to test different feedback styles, e.g. continuous feedback or more detailed feedback.

Overall, speakers valued the feedback and followed it while still speaking freely. The content could be integrated in their argumentation with increased self-rating of the debate (H1).

Discussion

We showed that a real-time feedback system can support debating novices in building arguments. We developed a feedback system that makes use of the structural characteristic of a debate and the rules how arguments should be presented, in order to enable real-time feedback in a debate. In our study, gaze durations of the speakers on their notes and the feedback system were less than one second. This indicates that feedback apparently was understandable easily and quickly.

We showed that the jury can serve as a mentor even during a debate. Even though the separation into the three main elements of an argument was valued by speakers, more dynamic feedback might improve the speaker support further. This might be done using a continuous rating scale rather than static feedback. The interface could be adapted to the speaker's personal

skills or adapted to the context, for instance during interaction with the audience (Figure 3b).

As a next step, we want to further investigate how learning of argumentation can be supported by real-time feedback. Because simplicity of the presented feedback is crucial, we will in a future study examine different complexity levels of structural feedback. We want to answer the question, how complex the displayed feedback can be so that the speaker still can apply the feedback without being disrupted. With that approach we want to generalize our results to different kinds of talks. All our findings will contribute to our final goal of a framework for systems that provide content-related, real-time feedback in a co-located environment.

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