Collaboration Support in Argumentation Systems for Education via Flexible Architectures

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Abstract

While argumentation is highly important for humans in many different aspects of life, it is hard to teach large groups to argue. Classic face-to-face approaches, which have shown to be effective, are limited by personal and time issues. Thus there were attempts to support the learning of argumentation via collaboration tools and Intelligent Tutoring Systems. A detailed review of about 50 argumentation systems indicated a lack of research on the architectural side as well as on the side of collaboration. This thesis will investigate how a generic, customizable software architecture and configurable flexible collaboration options can be used to support the learning of argumentation in different domains.

1. Introduction

Argumentation skills are critical for humans in many different aspects, e.g. in politics, science or even everyday life. Therefore, teaching argumentation skills plays a key role in modern education. Teaching these highly important skills is challenging even today. Classic face-to-face tutoring is still the favored methodology, but limited by personal and time issues, especially in large groups.

2. Argumentation Systems in Practice

Unsurprisingly, there have been attempts to support argumentation and especially the teaching of argumentation skills via software (e.g. [1]). Nevertheless a review of about 50 argumentation systems (done together with colleagues from Clausthal University of Technology and the German Research Center for Articial Intelligence as part of the *Learning to Argue:*

Generalized Support Across Domains (LASAD[1]) project) revealed limitations in several ways:

First, most argumentation systems are *inflexible*, i.e. they are either designed for a specific domain like law (e.g. LARGO [2]) or scientific argumentation (e.g. Convince Me [3]) or too general to fulfill domain-specific needs. A happy-medium approach, i.e. a tool that provides support for various domains based on a configurable basis it not available.

Second, even though practical argumentation takes place in groups usually, most of the reviewed systems were single-user based.

Third, argumentation systems that support collaboration (e.g. Belvedere [4], LARGO, Academic-Talk [5]) are *isolated*, i.e. they do not provide public interfaces to connect to other systems. Additionally, each system uses its own format (e.g. AML in Araucaria [6]) to save the produced data, i.e. not even the resulting arguments are exchangeable.

Fourth, sophisticated learning technologies like IMS-LD or scripts that could support learners are either only in parts or not at all integrated in modern argumentation systems.

Finally, there is a lack in methodology for building these systems. For example: While the importance of patterns and development models in general software engineering increased rapidly in the last decade there were only few comparable attempts for educational technology (e.g. [8] for CSCL or [9] for Intelligent Tutoring Systems).

3. Research Goals

Thus, my thesis will investigate the options of architectural support for flexible collaboration in

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[1] http://lasad.dfki.de

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educational argumentation systems. I will investigate the role of software architectures for flexibly supporting collaboration and learning, and the kinds of collaboration support that are beneficial in different phases of an argumentation process.

More concretely I will investigate the following: (1) Architectural Support for Collaboration, i.e. allow switching between different collaboration modes (2) Architectural Support for Learning, i.e. support for learning technologies and standards (3) Collaboration Support for Argumentation, i.e. which collaboration support fits best to which phase of argumentation

4. Current Research and Research Plans

Based on the review and direct e-mail contact to the authors of the most interesting systems a primary set of architectural requirements were collected and an architecture for a flexible system proposed [10].

Currently I am working on implementing a first prototype based on the proposed architecture. The system will be general enough to be domain independent and, at the same time, flexible enough to fulfill the needs of special argumentation domains. Thus, it will serve as research tool for my further investigations.

In the course of development there will be first steps of evaluation: (1) Think-aloud prototype testing with single students of different domains to identify usability lacks. (2) Think-aloud studies with small groups of students to identify required awareness support. (3) Questionnaires asked to be fulfilled by experts of domains on focus (law, ethics, and science) to get deeper insights into domain-specific needs. Based on the results of these evaluations, there will be iterative prototype refinements.

Further evaluations will include: (1) Pilot sessions with groups of medium size in all three test domains to evaluate the usefulness of the system in different conditions (individual and collaborative learning with/without the system including synchronous and asynchronous use of the system). These sessions will be recorded via audio, video and action log files. All participants will be interviewed to reveal improvement potentials of the system. (2) Collaboration studies to investigate the benefit of flexible collaboration support for learners (depending on the phase of argumentation) compared to static collaboration support. Thus I will run another set of sessions in real classroom situations. The groups will be divided into: learning via traditional tutoring, learning with flexible collaboration support and learning with static (a-)synchronous collaboration support. The resulting argument quality and learning benefits will be judged and compared by domain experts.

5. References

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