

## Chapter 2.4

# An Abstract Framework for Modeling Argumentation in Virtual Communities

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### ABSTRACT

Classic argumentative discussions can be found in a variety of domains from traditional scientific publishing to today's modern social software. An interactive argumentative discussion usually consists of an initial proposition stated by a single creator, followed by supporting propositions or counter-propositions from other contributors, usually part of the same virtual community. Thus, the actual argumentation semantics is hidden in the content created by the contributors. Although there are approaches that try to deal with this challenge, most of them focus on a particular domain, limiting the scope of the argumentation to that domain only. In this article, the authors describe an abstract model for argumentation

which captures the semantics independently of the domain. Following a modularized approach, the authors also take into account additional important aspects of the argumentation, like the provenance information or its evolution (the temporal side). Consequently, they present a possible usage of the framework in the context of virtual communities. [Article copies are available for purchase from InfoSci-on-Demand.com]

### INTRODUCTION

Argumentation can be found and captured in a variety of fields ranging from scientific publications, to ontology engineering, agent interaction or modern social software. An interactive argu-

mentative discussion usually starts with an initial proposition stated by a single creator. This is then followed by supporting propositions or counter-propositions from other contributors. The actual semantics of the argumentation is hidden in the content created by the participants and therefore it is difficult to leverage this for use by machines.

Externalization represents the process of transforming implicit knowledge (such as the knowledge hidden in the argumentative discussions) into explicit knowledge, thus making it machine-processable (Nonaka et. al, 1995). One way of achieving externalization is by using formal models (ontologies) to capture the argumentation. There exist an important number of argumentation models, most of them following the direction given by the IBIS methodology (Kunz et. al, 1970). One of the main issues with each of these models is the focus on a particular knowledge domain, therefore limiting the view of the argumentation to the scope of that domain only.

When trying to model argumentation in a new domain, one faces the challenge of choosing the ‘best’ option from the current ones in existence, with the remark that only partial re-use is possible due to domain restrictions. As a result, in most cases researchers will tend to create a new model for their specific domain. This clearly shows the lack of an abstract enough model which allows a straightforward specialization for different specific needs. In addition, such a model should be able to fulfill a series of requirements dealing some pragmatic issues, like modularization, provenance or evolution.

In this article, we propose an abstract argumentation framework, which covers all of the above-mentioned issues. The framework is comprised of two layers: (i) a document model, capturing the environment in which the argumentation is present, and (ii) the argumentation model itself.

By having two layers, we follow a modularized approach, making a clear distinction between the document providing the provenance information and the identification of the argumentation ele-

ments and the argumentation per se. Based on the specific domain, a third layer can be added, thus introducing domain knowledge into the model. In addition, since such knowledge has its own particular terminology and language, this layer could also be comprised of linguistic features, providing the means to build semi-automatic knowledge acquisition tools.

In the following, we introduce the use-cases and requirements driving our framework. Then, we describe the framework itself, and before concluding, we re-visit the use-cases and present the relevant related work in the field.

## USE CASES

As already mentioned, argumentation can be found and modeled in a variety of domains. Such domains usually have in common, besides the presence of argumentative discussions, also the organizational environment, while differing through the type of domain knowledge involved in the argumentation, or the physical environment (e.g. publications, forums, blogs, etc) in which the argumentation takes place. A common example of organizational environment is represented by virtual communities. These can be seen, from a simplistic perspective, as a group of people sharing a loose common interest, via virtual communication paths. Among such virtual communities, we could mention: online communities, scientists focused on a particular domain, lawyers, etc. An important remark is that all the previous examples share, in one way or another, the presence of argumentative discussions. For example, dissemination represents a communication channel between scientists, spanned across multiple publications. They make claims, state positions and argument these positions, and thus, creating a virtual argumentative discourse network. In the following, we will focus on one particular use case, covering to a big extent all the others, i.e. online communities.

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