

# TOAST: online ASPIC<sup>+</sup> implementation

Mark SNAITH and Chris REED

*School of Computing, University of Dundee, DUNDEE, DD1 4HN, UK*

**Abstract.** In this paper, we present TOAST, a system that implements the ASPIC<sup>+</sup> framework. TOAST accepts a knowledge base and rule set with associated preference and contrariness information, and returns both textual and visual commentaries on the acceptability of arguments in the derived abstract framework.

**Keywords.** Structured argumentation, abstract argumentation, ASPIC<sup>+</sup>

## 1. Introduction

The ASPIC<sup>+</sup> framework of [4] built on the work of [1] and instantiates Dung's abstract approach to argumentation [3] by providing structure to arguments, while still allowing an abstract framework to be derived and, ultimately, evaluated using established acceptability semantics.

In this paper, we present TOAST<sup>1</sup>, an implementation of ASPIC<sup>+</sup>, which allows a structured argumentation system to be processed into arguments and attacks from which a Dung-style framework can be derived and evaluated.

## 2. The TOAST system

TOAST is implemented entirely in Java, with argument evaluation performed by the Dung-O-Matic web service [6]. Attacks between arguments are generated using the contrariness function, with successful attacks (i.e. defeat) being calculated by applying preferences. It is the defeat relations that are sent to Dung-O-Matic, along with the arguments, for evaluation.

### 2.1. Usage

TOAST is accessible in two ways — through a web form<sup>2</sup>, which allows a user to provide a knowledge base, rule set, contrariness and preferences to construct an argumentation system and theory, and a web service<sup>3</sup>, which allows TOAST to integrate with other software systems.

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<sup>1</sup>The Online Argument Structures Tool

<sup>2</sup><http://www.arg.dundee.ac.uk/toast>

<sup>3</sup><http://www.arg.dundee.ac.uk/toast/api>

On the web form, options are provided that allow the resultant argumentation theory to be considered under four different semantics, using either the last-link or weakest-link principles for argument semantics evaluation. When processing is completed, textual and visual commentaries on the acceptability of arguments in the abstract framework derived from the system are returned.

The web service interface accepts and returns JSON; a string containing the components of an argumentation system is posted to the service, which returns a string listing the arguments, the defeat relations between them and the extension(s) of the derived framework under the requested semantics.

### 3. Applications

#### 3.1. The Argument Web

A connection exists between the Argument Interchange Format (AIF) [2] and the ASPIC<sup>+</sup> framework. This connection has been exploited to connect TOAST to the argument web, allowing evaluation of natural arguments gathered using tools such as OVA and Arvina [7].

#### 3.2. Medical reasoning

TOAST has already been deployed in a medical domain by [5]. The system is used in two ways — the first is to establish if there is sufficient evidence to substitute missing data with data that is available; the second, and core function, is to pose critical questions of the completed analyses to establish the credibility of results, and whether or not they are consistent with other projects or previous conclusions. This application has seen TOAST successfully process argumentation systems containing in excess of 17,000 rules.

### References

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