January 2018

DISCO: a Web-Based Implementation of Discussion Games for Grounded and Preferred Semantics

Richard BOOTH [a] Martin CAMINADA [a,1] Braden MARSHALL [a]
[a] *School of Computer Science & Informatics, Cardiff University*

Keywords. abstract argumentation, argument-based discussion

1. Introduction

One of the advantages of formal argumentation theory as a way of defining non-monotonic inference is that it applies concepts that are close to human reasoning, like arguments and discussion. In recent years, various discussion games for formal argumentation have been stated [2]. The idea is that these discussion games can be used as proof procedures for the different argumentation semantics. That is, an argument is accepted with respect to a particular semantics iff it is possible to win the associated discussion game.[2] This makes it possible to use the discussion games for the purpose of explanation. Instead of simply mentioning that an argument is in, say, the grounded extension, the computer can allow the user to raise objections (counter arguments) and address these (using counter counter arguments) after which the user is again allowed to raise objections, etc. The aim is that at some moment, all the user's potential objections have been uttered and addressed, and that the user is ready to accept the argument the discussion started with.

Our current demonstrator DISCO[3] (DIscussion COmputation) provides a web-based implementation of the Preferred Game [3] and of the Grounded Discussion Game [1].[4] The demonstrator is based entirely on Javascript, and all computation is performed at client side. On starting, the user can either open an existing argumentation framework (which uses a JSON based file format) or construct one manually by adding arguments and attacks to an initially empty canvas. Once the argumentation framework has been defined, the user can play either the preferred game or the grounded discussion game.

[1] Corresponding Author. Email: CaminadaM@cardiff.ac.uk

[2] More precisely, if there exists a discussion for an argument that is won by the proponent then the argument is accepted w.r.t. the argumentation semantics in question, and if the argument is accepted w.r.t. the argumentation semantics in question then the proponent has a winning strategy for it in the associated discussion game [2].

[3] available at `http://disco.cs.cf.ac.uk`

[4] Please notice that the theoretical work the current demonstrator is based on [3,1] improves upon earlier work [4] in that the number of required discussion moves is related *linear* (instead of exponential) to the relevant (strongly) admissible set. We refer to [2] for details.

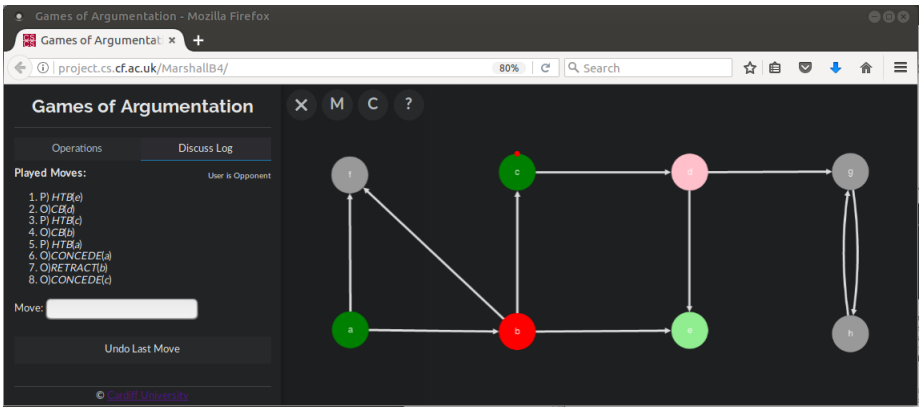

Figure 1. Screenshot of playing the Grounded Discussion Game

In each case, the user can choose whether he/she wants to play as the proponent or as the opponent (of a specific argument). The user and computer then take turns in playing argument moves. The moves of the user can be typed into a text field, or can be selected by clicking on the relevant arguments. The moves of the computer are played when the user clicks the "Take AI Turn for Proponent" or "Take AI Turn for Opponent" button. The game is such that if the computer plays as the proponent for an argument that is in the grounded extension (resp. in a preferred extension) the computer will ultimately win the game, as it follows the associated winning strategy [2].

Apart from the above described core functionality, some additional features are also available. For instance, once an argumentation framework has been defined, it is possible to save it for future use, as well as to save an image (in PNG format) of it. Also, when playing either the preferred game or the grounded discussion game, it is possible for the user to ask for suggestions regarding the legal moves he/she can take. In addition, when playing the grounded discussion game, it is possible to view the grounded labelling and the associated min-max numbering [1].

In the future, we hope to present a similar demonstrator regarding not abstract but instantiated argumentation, where the user and computer are able to construct arguments on the fly from a given knowledge base, ideally using natural language. Our overall aim is to have human-computer discussion resemble as much as possible human-human discussion.

References

[1] M.W.A. Caminada. A discussion game for grounded semantics. In E. Black, S. Modgil, and N. Oren, editors, *Theory and Applications of Formal Argumentation (proceedings TAFA 2015)*, pages 59–73. Springer, 2015.

[2] M.W.A. Caminada. Argumentation semantics as formal discussion. In *Handbook of Formal Argumentation*, volume 1, pages 487–518. College Publications, 2018.

[3] M.W.A. Caminada, W. Dvořák, and S. Vesic. Preferred semantics as socratic discussion. *Journal of Logic and Computation*, 26:1257–1292, 2014.

[4] S. Modgil and M.W.A. Caminada. Proof theories and algorithms for abstract argumentation frameworks. In I. Rahwan and G.R. Simari, editors, *Argumentation in Artificial Intelligence*, pages 105–129. Springer, 2009.