Formalizing Practical Argumentation

Henry Prakken
Department of Computer Science
Vrije Universiteit Amsterdam, The Netherlands

Bahia Blanca, June 1998

1 Aim and topic of the course

When people face a practical problem, on what to do, believe or decide, they often engage in practical argumentation. This takes place in daily life, law, bureacracies and organisations, etcetera. In practical argumentation (whether alone or debating with other people) arguments for and against a solution to a problem are constructed, attacked and compared, to see which solution is tenable.

The aim of this course is to give insight in the problems and prospects of formalizing practical argumentation for the purpose of AI implementation. The main source of inspiration and examples will be legal reasoning. The general structure of the course is given by a four-layered picture of practical argumentation:

- The *logical* layer, that defines the construction of arguments;
- the *dialectical* layer, that defines when arguments attack each other, and which arguments prevail;
- the *procedural* layer, that states discourse norms for entering new information into or withdrawing old information from a dispute;
- the *stategic* laywer, that defines rational strategies and heuristics for conducting a dispute

A crucial difference between the first two and the last two layers is that in the first two layers the information on which the reasoning operates is fixed, while in the last two layers the information is constructed dynamically in the course of a dispute.

2 Overview of the lectures

1 Introduction

- Introduction
- Background: four layers in argumentation
- Overview of the course

Reading:
- [Prakken & Vreeswijk, 1998], Sections 1, 2 and 3

2 Logics for defeasible argumentation I. Semantics

- The idea of status assignments. Argument-based semantics in the style of Bondarenko, Dung, Kowalski and Toni, in particular how various notions of defeasible consequence can be defined.
- Partial computation (Pollock). The idea of defeasibility as arising from partial computation instead as from incomplete information.
- Reasoning about priorities (Prakken & Sartor)

Reading:
- [Prakken & Vreeswijk, 1998], Sections 4, 5.2 and 5.7

3 Logics for defeasible argumentation II. Dialectical proof theory

The idea of a defeasible proof as a dialogue game between a proponent and an opponent of a claim.

Reading:
- [Prakken & Vreeswijk, 1998], Section 6
- [Prakken, 1998].

4 AI & Law research on adversarial argumentation

Discussion of two (implemented) benchmark systems for adversarial argumentation in the legal domain.

- HYPO: a system for analogical reasoning with cases.
- CABARET: a system for combining reasoning with cases and with rules.

Reading:
- [Ashley, 1989] or (if you have time) [Ashley, 1991]
- [Skalak & Rissland, 1989]

- [Prakken & Sartor, 1998], Sections 3.1 and 3.3.

5 Formalizing adversarial reasoning with precedents

A Formal reconstruction of HYPO-style arguing with cases, in terms of Prakken & Sartor's system of defeasible argumentation.

- Analogy: inference or heuristic?
- 'Actual' dialogues: dialogues in which the set of premises is constructed dynamically, during the dialogue.

Reading:
- [Prakken & Sartor, 1998], Sections 1, 4, 5 and 6.

6 On formalizing the procedural layer

Two studies of dialectical protocols for dispute.

- Gordon's Pleading's Game: an AI model of procedural justice
- Vreeswijk on self-modifying procedures.

Reading:
- [Gordon, 1993]
- [Vreeswijk, 1996]

7 Formalizing rules of order for meetings

A discussion of a research project to add rules of order to an electronic discussion and decision making forum. Part of the project is to formalize Robert's Rules of Order, the standard rules of parliamentary procedure in the USA.

Reading:
- [Prakken & Gordon, 1998]

8 Argumentation and negotiation

Discussion of a formal model of negotiation as defeasible argumentation.

Reading:
- [Parsons *et al.*, 1998]

9 Evaluation and discussion

References

[Ashley, 1989] Ashley, K.D. 1989. Towards a computational theory of arguing with precedents: accomodating multiple interpretations of cases. *Proceedings of the Second International Conference on Artificial Intelligence and Law*, 93–99. New York: ACM Press.

[Ashley, 1991] Ashley, K.D. 1991. Reasoning with cases and hypotheticals in HYPO. *International Journal of Man–Machine Studies* 34 (1991), 753–796.

[Gordon, 1993] Gordon, T.F. 1993. The pleadings game — formalizing procedural justice. *Proceedings of the fourth International Conference on Artificial Intelligence and Law*, New York, ACM Press, 1993, 10–19.

[Parsons *et al.*, 1998] Parsons, S., Sierra, C. & Jennings, N.R. 1998. Agents that reason and negotiate by arguing. To appear in *Journal of Logic and Computation.*

[Prakken, 1997] Prakken, H. 1997. *Logical Tools for Modelling Legal Argument. A Study of Defeasible Reasoning in Law.* Dordrecht etc.: Kluwer Law and Philosophy Library.

[Prakken, 1998] Prakken, H. 1998. Dialectical proof theory for defeasible argumentation with defeasible priorities (preliminary report). To appear in *Proceedings of the Fourth ModelAge Workshop on Formal Models of Agents*, Springer Lecture Notes in AI. Berlin: Springer Verlag.

[Prakken & Gordon, 1998] Prakken, H. & Gordon, T.F. 1998. Applying Robert's Rules of Order to automated mediation of group decision making. Submitted.

[Prakken & Sartor, 1998] Prakken, H. & Sartor, G. 1998. Modelling reasoning with precedents in a formal dialogue game. To appear in *Artificial Intelligence and Law*, 1998.

[Prakken & Vreeswijk, 1998] Prakken, H. & Vreeswijk, G. 1998. Logical systems for defeasible argumentation. To appear in D. Gabbay (ed.), *Handbook of Philosophical Logic*, second edition.

[Skalak & Rissland, 1989] Rissland, E.L. & Skalak, D.B. 1989. Interpreting statutory predicates. *Proceedings of the Second International Conference on Artificial Intelligence and Law*, 46–53. New York: ACM Press.

[Vreeswijk, 1996] Vreeswijk, G. 1996. Representation of formal dispute with a standing order. *Research Report MATRIX, University of Limburg.* To appear in *Artificial Intelligence and Law*, 1999.