Persuasive Stories for Multi-Agent Argumentation

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Abstract

In this paper, we explore ideas regarding a formal logical model which allows for the use of stories to persuade autonomous software agents to take a particular course of action. This model will show how typical stories – sequences of events that form a meaningful whole – can be used to set an example for an agent and how the agent might adapt his own values and choices according to the values and choices made by the characters in the story.

Introduction

Practical reasoning, justifying a choice of action by a particular agent in a particular situation, is central to the reasoning abilities of autonomous agents (Wooldridge 2000). But different agents may rationally disagree as to the action to choose, since they may differ in their interests and aspirations. One way to represent this computationally is to differentiate agents according to how they order social values: an argument to raises taxes may be accepted if equality is preferred to enterprise and rejected with the opposite preference.

A philosophically and computationally feasible account of practical reasoning with values has recently been developed by (Atkinson et al. 2007). This approach uses simple arguments of a syllogistic form to guide a choice of action: *if* faced with a set of circumstances, *then* the agent should perform a certain action to get the consequences he desires, that is, to achieve his goals and promote his values. Such arguments can attack each other and thus an agent can try to persuade itself or another agent on the appropriate action to take in the current circumstances. The dialectical process of persuasion using arguments, the various forms of argument and the ways in which they can

be criticized have been extensively discussed in the literature (Walton 1990; van Eemeren et al. 1996). Furthermore, the computational properties of such arguments are clearly defined (Dung 1995; Prakken and Vreeswijk 2002).

However, in a context of persuasion people will often tell a story (i.e. a sequence of events caused or experienced by actors) rather than give an argument based on conditional rules. For example, teaching a child not to lie is easier done by telling the story of *The Boy Who Cried Wolf*[1] than by presenting an argument that one should not tell lies in circumstances where there is no gain in telling the lie because this will demote the value of honesty and consequently people will not believe you when you do tell the truth. In a sense, stories can be thought of as more psychologically feasible than arguments, because our thoughts and memories are more often collections of stories rather than arguments (Schank 1990).

A story does not persuade by imparting explicit rules or values, but instead by having an agent identify with the situations or actors in a story. Understanding a story involves identifying the situations in the story, the internal motivations of the characters in the story, the choices made by these characters and the consequences of these choices. Persuasion then occurs through identification with one of the characters, through a combination of correspondence of facts and attitudes, and then recognising the consequences of the attitude and adapting one's own attitude accordingly. Identification with a character can be situational (I am in a similar situation, e.g. a child hearing *the Boy who cried Wolf*) or attitudinal (that character has the most similar value preferences to me).

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[1] This well-known fable tells about a shepherd boy who cries 'Wolf! Wolf!' to amuse himself. At first the villagers come to his aid, but after a few times they do not believe him anymore, even when there is a real wolf who scattered his sheep.

Conclusions and future research

As indicated above, the main work on both persuasive and practical reasoning has so far mainly concentrated on reasoning with arguments. Agent-based persuasion and negotiation uses a variety of techniques (see e.g. Rahwan et al. 2004), but stories are not one of them. The use of stories by agents has mainly been studied in the context of case-based reasoning (Ram 1989), where agents use specific knowledge of previous situations and courses of events (i.e. stories) to solve a problem. However, we are not necessarily interested in problem-solving, but rather in how other agents may be persuaded. Consequently, we aim to explore the role of stories in persuasion, particularly in the context of value-based practical reasoning with agents. Important questions in this respect are:

1. What is the structure of a story?
What are the important elements (e.g. values, types of situations, types of characters) in understanding a story? What is the point of a story and how can this point be derived from a story?

2. When is a story persuasive for a particular agent?
Which elements in a story (e.g. values, goals, types of situations, types of characters) serve as an example for the audience? How does an agent compare his own beliefs and knowledge to the elements in a story or the point of a story? When and to what extent does an agent identify with a story or a character?

3. Given an agent and his knowledge of different stories, how does an agent choose an action?
Which conclusions does an agent draw from its identification with a particular story or character? How does an agent choose between multiple plausible stories?

4. What is the relation between arguments and stories in the context of practical reasoning?

The aim is to answer each of these questions by proposing a model for agent-based practical reasoning that uses stories. Important is that this model is not just) computationally feasible, but that it also draws insprration from psychology and sociology (e.g. Macy and Willer 2002). Question 1 has been discussed in much of the research on story structures in literary theory, cognitive psychology and AI (see Bex 2009 and Kwiat 2009 for a comprehensive overview). It would be interesting to see which story-structure is needed for current purposes. Also, a small corpus typical stories represented using the structure of choice will be needed. Question 2 is largely an open question, and also depends on the Multi-Agent architecture used. Question 3 and 4 overlap in that they are both about the combination of argumentation and stories. For example, drawing a conclusion from a story (or from one's identification with an actor in the story) can be seen as argumentative inference. Furthermore, question 4 can be seen more broadly: what is the relation between arguments and stories in any reasoning context? In his previous work, Bex (2009) discusses reasoning with stories but the focus is on how a story can be supported by arguments based on evidence and not directly on the persuasiveness of stories.

References

Atkinson, K., Bench-Capon, T., and McBurney, P. 2006. computational representation of practical argument. *Synthese* 152:2, 157 – 206.

Bex, F.J. 2011. *Arguments, Stories and Criminal Evidence. A Formal Hybrid Theory*. Law and Philosophy Series vol. 92, Springer, Dordrecht.

Dung, P.M. 1995. On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n–person games. *Artificial Intelligence* 77:2, 321 – 357.

Eemeren, F.H. van, Grootendorst, R., Henkemans, F.S., Blair, J.A., Johnson, R.H., Krabbe, E.C. W., Plantin, C., Walton, D.N., Willard, C.A., and Woods, J. 1996. *Fundamentals of argumentation theory*, Lawrence Erlbaum, Hillsdale (New Jersey).

Kwiat, J. 2009. *Multi-Perspective Annotation of Digital Stories for Professional Knowledge Sharing within Health Care*. (Doctoral dissertation) Technical Report KMI-09-02, Knowledge Media Institute, The Open University, UK.

Macy, M.W. and Willer, R. 2002. FROM FACTORS TO ACTORS: Computational Sociology and Agent-Based Modeling. *Annual Review of Sociology* 28, 143-166.

Prakken, H., and Vreeswijk, G. 2002. Logics for defeasible argumentation. In Goebel, R. and Guenthner, F. (eds.), *Handbook of Philosophical Logic*, 219 – 318, Kluwer Academic Publishers, Dordrecht.

Ram, A. 1989. *Question-Driven Understanding: An Integrated Theory of Story Understanding, Memory, and Learning*. (Doctoral dissertation) Yale University.

Rahwan, I., Ramchurn, S.D., Jennings, N.R., McBurney, P., Parsons, S., and Sonenberg, L. 2004. Argumentation–based negotiation. *The Knowledge Engineering Review* 18:04, 343 – 375.

Schank, R.C. 1990. *Tell Me A Story: a new look at real and artificial memory*. Scribner.

Walton, D. N.: 1990, *Practical Reasoning: Goal-Driven Knowledge-Based Action-Guiding Argumentation*, Rowman and Littlefield Savage, Maryland, USA.

Wooldridge, M. 2000. *Reasoning about Rational Agents*. MIT Press.