

Gorgias-B: Argumentation in Practice

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Abstract

Gorgias-B is a new tool that supports a methodology for the development of real life applications. It can be used by non-argumentation experts generating and testing automatically the target argumentation theory in *Gorgias*.

Introduction

Argumentation technology is well suited for implementing decision making mechanisms under conflicting, incomplete and contextual knowledge. It allows choosing preferred options (e.g. actions) among a list of possible (usually conflicting) alternatives under some decision policy of an application. *Gorgias* (Kakas and Moraitis 2003) is a system based on preference-based argumentation that has been used during the past ten years by different users for developing real life applications, e.g. portfolio management (Pendaraki and Spanoudakis 2015), provision of services in ambient intelligence (Moraitis and Spanoudakis 2007), medical diagnosis (Letia and Acalovschi 2004), product pricing (Spanoudakis and Moraitis 2009), management of firewall policies (Bandara et al. 2009), conflicts resolution in pervasive services (Benazzouz and Boyle 2011), etc.

Based on the study of these applications we have developed a new tool, *Gorgias-B*, to support the development of applications of argumentation under *Gorgias*, following a general software methodology that allows users, even with little or no knowledge of argumentation, to model decision policies for their application domain. *Gorgias-B* guides the developer to structure his/her knowledge at several levels. The first level serves for enumerating the possible decisions and arguments that can support these options under some conditions, while each higher level serves for resolving conflicts at the previous level by taking into account default or contextual knowledge.

The *Gorgias-B* Tool

The *Gorgias-B* tool is a graphical forms application. Five consecutive screen shots of its operation are presented in figure 1 for the development of a seller agent.

In the first screen (bottom) the user has defined two conflicting options, i.e. to sell products to agents at a high price or to sell them at a low price. Options appear on the left and then defined as complementary (or conflicting) on the right.

After defining the various options the user can press the button "Add arguments for options" opening the dialogue in the next screen shot (second from bottom-up in the figure). This shows two arguments, a default one for selling high and another for selling low (WHEN the buyer agent accepts to pay cash). By following the button "Resolve conflicts" a new dialogue (third from bottom-up in the figure) appears. Here, we can select conflicting arguments of the previous level and assign priorities. In the specific screen, "sell high" is preferred as a default policy for the seller. However, in the case of a regular customer, selling low is preferred over selling high, thus giving higher priority to the more specific context. In this more specific context, i.e. of [pay cash, regular customer], we still have a conflict between the priorities, and, hence, the options. In the fourth screenshot we see that we can resolve this conflict at a next level considering that the option low is preferred when it is not high season whereas in high season selling high is preferred. Due to the complementarity of these two refinements of the context there is no need for further resolution at a next level.

During this process the tool generates automatically an argumentation theory that captures the high-level specification entered by the developer within the argumentation framework of *Gorgias* [1]. This theory can be executed through the *Gorgias-B* tool (see last screen from bottom-up) by specifying scenarios of interest and asking which options are credulously or sceptically entailed in the scenarios. The tool returns these together with the admissible arguments that support them. *Gorgias-B* allows also to specify some predicates as *abducible*, and the tool can find scenario conditions under which an option or a conclusion will be entailed. In the last screenshot, we see that to support a low selling scenario, the assumption of payment in cash must hold.

Gorgias-B is freely available from <http://gorgiasb.tuc.gr>. Apart from application development it can also be used to demonstrate argumentation and how it supports defeasible reasoning.

References

Bandara, A. K.; Kakas, A. C.; Lupu, E. C.; and Russo, A. 2009. Using argumentation logic for firewall configuration management. In *Integrated Network Management, IM 2009. 11th IFIP/IEEE International Symposium on Inte-*

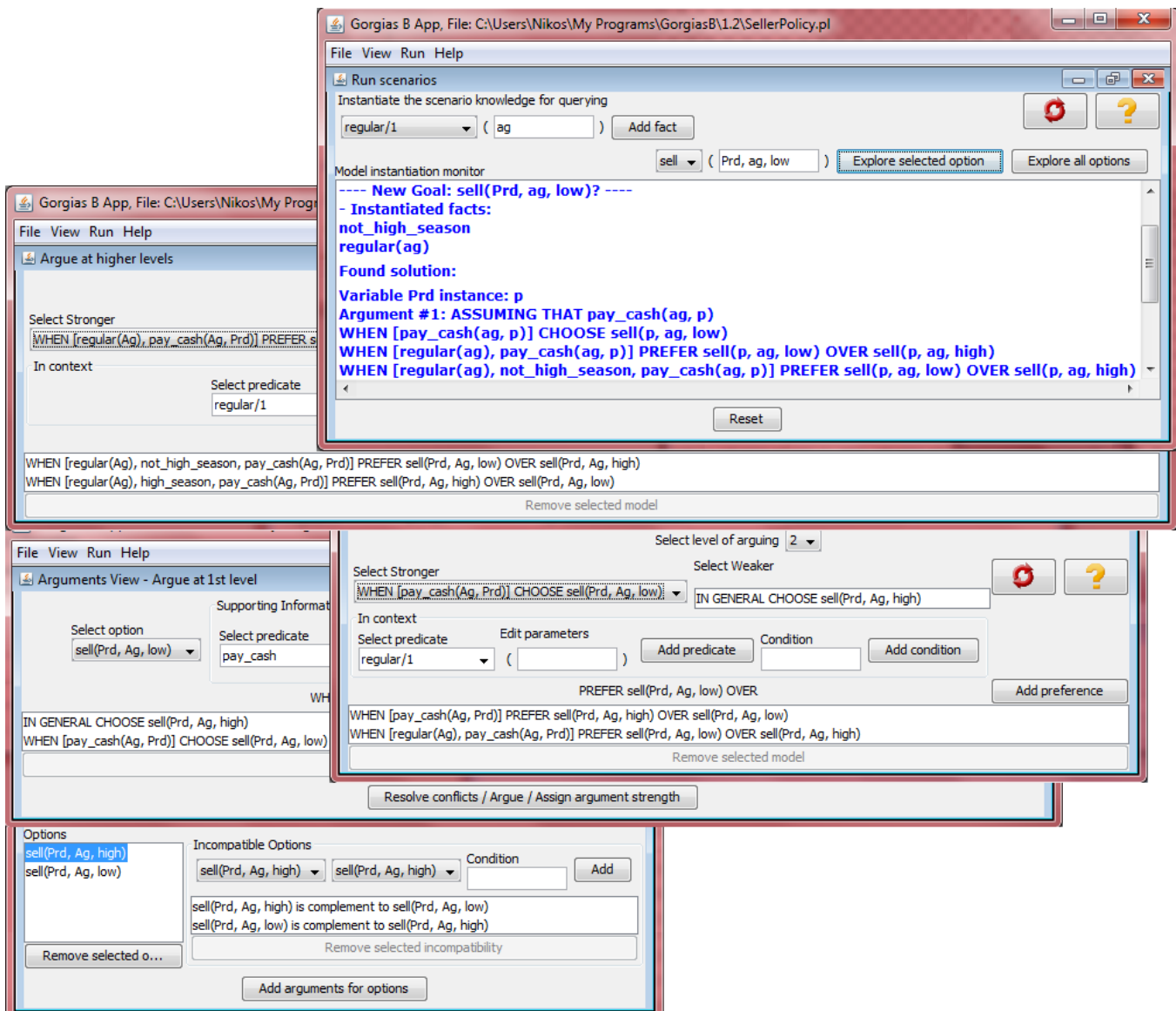


Figure 1: Gorgias-B screenshots

grated Network Management, Hofstra University, Long Island, NY, USA, June 1-5, 2009, 180–187.

Benazzouz, Y., and Boyle, D. 2011. *Negotiation and Argumentation in Multi-Agent Systems: Fundamentals, Theories, Systems and Applications*. Bentham Science Publisher. chapter Argumentation-Based Conflict Resolution in Pervasive Services, 399–419.

Kakas, A. C., and Moraitis, P. 2003. Argumentation based decision making for autonomous agents. In *The Second International Joint Conference on Autonomous Agents & Multiagent Systems, AAMAS 2003, July 14-18, 2003, Melbourne, Victoria, Australia, Proceedings*, 883–890.

Letia, I. A., and Acalovschi, M. 2004. Achieving competence by argumentation on rules for roles. In *Engineering Societies in the Agents World V, 5th Int. Workshop, ESAW*

2004, Toulouse, France, October 20-22, 2004, Revised Selected and Invited Papers, 45–59.

Moraitis, P., and Spanoudakis, N. I. 2007. Argumentation-based agent interaction in an ambient-intelligence context. *IEEE Intelligent Systems* 22(6):84–93.

Pendaraki, K., and Spanoudakis, N. I. 2015. Portfolio performance and risk-based assessment of the PORTRAIT tool. *Operational Research* 15(3):359–378.

Spanoudakis, N. I., and Moraitis, P. 2009. Automated product pricing using argumentation. In *Artificial Intelligence Applications and Innovations III, Proceedings of the 5TH IFIP Conference on Artificial Intelligence Applications and Innovations (AIAI'2009), April 23-25, 2009, Thessaloniki, Greece*, 321–330.