Modelling Distributed Policies: Interaction vs. Merging

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Abstract. Policies can be defined as a set of instructions for how a human or automated entity in a system should behave given a certain context and external stimuli. They go beyond this in that they should also describe what is "incorrect" behaviour and what mechanisms to apply in order to deal with this unexpected situation.
Given the multiplicity of aspects that have to be considered in order to make the "right" (correct, appropriate, better rewarded,. . .) decision, it would be desirable, in many cases, to be supported by a system that is capable to consider all the issues involved and then recommend an appropriate course of action.
To make these recommendations we need a formal description of how such a system could automatically go from a policy specification to an appropriate outcome through deduction. One crucial issue in the formal analysis of policies is to deal with situations in which there are different actors involved with each their own policies, or when social decisions should be taken by considering the point of view of different counterparts. This raises research issues in the field of Logic Programming, Knowledge Representation and Automated Reasoning: how can a policy be specified in terms of logic rules? What if there are conflicting results and no decision immediately "wins"? How should a system verify that everything works and then come to a conclusion?
Recently, policy research has focused on composing several policies into one, but this may not always be the best modelling choice: in some cases we may want to describe the complex behaviour of composite systems while maintaining the behaviour of the individual components. Examples of such systems are virtual institutions, normative framework and distributed reactive systems.
For these reasons we want to investigate the problem of modelling distributed policies from a multi-agent perspective: the key point is that of modelling interaction via composition rather than merging, obtaining a set of individual behaviours that do not compromise consistency rather than one complex and conflict-free global behaviour.
We propose the use of Answer Set Programming (ASP) for the design of, verification of and reasoning about composite policies (i.e. policies that may interact with one another), with the objective of providing a general model for the behaviour of autonomous systems able to react and support decisions using an appropriate formalization of policies and efficient reasoning techniques.