A Logical Understanding of Legal Interpretation

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Abstract

If compliance with a norm does not achieve its purpose, then its applicability must dynamically be restricted or expanded. Legal interpretation is a mechanism from law allowing norms to be adapted to unforeseen situations. We model this mechanism for norms regulating computer systems by representing the purpose of norms by social goals and by revising the constitutive rules defining the applicability of norms. We illustrate the interpretation mechanism by examples.

Introduction and Motivation

Norms regulating computer systems can be modelled in different ways, see, for example, (Boella, van der Torre, and Verhagen 2008). If norms are represented by hard constraints, then computer systems are designed to avoid violations. Alternatively, if norms are represented by soft constraints, then they provide standards that can be violated, and violations should result in sanctions. Soft constraints allow agents to optimize their performance by reasoning about the trade off between respecting the norm and the risk of being sanctioned.

However, an agent can respect a norm even when the compliance of the norm does not benefit the system, thus wasting his resources while the system achieves only a suboptimal state. If norm compliance does not achieve the purpose of a norm, then its applicability must dynamically be restricted or expanded.

Legal interpretation is a mechanism from law allowing norms to be adapted to unforeseen situations. The research question of this paper is:

- How to model the interpretation mechanism of law, in order to design more flexible computer systems regulated by norms?

We model norms as plans aiming to achieve the social goals the members of a society decided to share (Boella and van der Torre 2007). The legislator could try to specify all the circumstances to which a norm applies and all the exceptional contexts where it does not apply, but, as well known in the planning community of AI, universal plans rarely are a practicable strategy. An agent should rather produce a partial plan and revise it when part of it becomes unfeasible.

In the same way as replanning allows an agent to revise its plans while keeping fixed its original goals, legal interpretation allows norms to be adapted after their creation to the unforeseen situations in order to achieve the social goal they have been planned for.

To model legal interpretation we use the distinction between regulative norms (obligations, prohibitions and permissions) from constitutive rules. While the former, which are changed only by the legislative system, specify the ideal behaviour, the latter ones provide, by means of counts-as definitions, an ontology of institutional concepts (Boella and van der Torre 2004). The applicability conditions of legal rules very often refer to these institutional concepts, rather than to so called brute facts. To simplify the notation we refer to the former as constitutive rules, and the latter simply as norms. To model the revision of norms, we use an extension of Defeasible Logic (DL) (Governatori and Rotolo 2008).

Legal Interpretation

Norms have a conditional structure such as $b_1, \ldots, b_n \Rightarrow_O l$ (if $b_1, \ldots, b_n$ hold, then l is obligatory); an agent is compliant with respect to this norm if l is obtained whenever $b_1, \ldots, b_n$ is derived. Most logical models of legal reasoning assume that conditions of norms give a complete description of their applicability (Sartor 2005). However, this assumption is too strong, due to the complexity and dynamics of the world. Norms cannot take into account all the possible conditions where they should or should not be applied, giving rise to the so called "penumbra": a core of cases which can clearly be classified as belonging to the concept. By a penumbra of hard cases, membership of the concept can be disputed. Moreover, not only the world changes, giving rise to circumstances unexpected to the legislator who introduced the norm, but even the ontology of reality can change with respect to the one constructed by the law to describe the applicability conditions of norms. See, e.g., the problems concerning the application of existing laws to privacy, intellectual property or technological innovations in healthcare.

To cope with unforeseen circumstances, the judicial system, at the moment in which a case concerning a violation is discussed in court, is empowered to interpret, i.e., to change norms, under some restrictions not to go beyond the purpose

from which the norms stem. The distinction between norms and constitutive rules suggests that legal interpretation does not amount to revising norms, but to interpreting legal concepts, i.e., to revising constitutive rules.

In this paper we adopt the view that the ontology of legal concepts is built via constitutive rules having the so-called counts-as form (Searle 1995): $r : a_1, \ldots, a_n \Rightarrow_c b$. For example, a bicycle is considered as a vehicle by the following constitutive rule:

$$r_0 : Bike(x) \Rightarrow_c Vehicle(x)$$

This counts-as rule, if instantiated by any bicycle a, says that a counts as a vehicle.

Constitutive rules have a defeasible character, for example, a bicycle for children cannot be considered as a vehicle:

$$r_1 : Bike(x), ForChildren(x) \rightsquigarrow_c \neg Vehicle(x)$$

$$r_0 \succ r_1$$

As usual in DL, our language includes (1) a superiority relation $\succ$ that establishes the relative strength of rules and is used to solve conflicts, (2) special rules marked with $\rightsquigarrow$, called defeaters, which are not meant to derive conclusions, but to provide reasons against the opposite.

The set of norms is fixed: any judge during the interpretation process can argue about their applicability conditions but cannot either add new rules nor cancel them. Only legislators have the power to change norms.

Norms have the form $r : b_1, \ldots, b_n \Rightarrow_O l$, for example:

$$r_2 : Vehicle(x), Park(y) \Rightarrow_O \neg Enter(x, y)$$

This rule reads as follows: if x is a vehicle and y is a park, then it is (defeasibly) forbidden for any x to enter y.

Finally, as usually assumed in legal theory (Sartor 2005), we assign goals to norms. In the social delegation cycle (Boella and van der Torre 2007) norms are planned starting from goals shared by the community of agents. However, such goals play also another role: they pose the limits within which the interpretation process of the judicial systems must stay when interpreting norms.

Note that the goal alone is not sufficient to specify a norm, since there could be many ways to achieve that goal and some guidance should be given to the citizens. Thus, the norm works like a partial plan the legislator sets up in advance. The judicial system is left with the task of dynamically adapting the applicability of the regulative norm by revising the constitutive norms referring to its applicability conditions, in order to fulfil the goal of the norm also under unforeseen circumstances.

We define a set Goal of goals and a function $\mathscr{G}$ which maps norms into elements of Goal. For example, if $\mathscr{G}(r_2) = road\_safety$, this means that the goal of the rule prohibiting to enter into parks is to promote road safety.

Checking compliance requires to establish if a norm $r : b_1, \ldots, b_n \Rightarrow_O l$ is violated by a fact or action l happened under some circumstances H. Let us assume that r states that $\neg l$ ought to be the case. However, l is not necessarily a violation, because we also have to check whether H, via the constitutive rules, matches with the applicability conditions $b_1, \ldots, b_n$ of r. In easy cases, these match and l directly amount to a violation. However, jurists argue that we have cases where this does not hold, as for example when there is a discrepancy between the literal meaning of $b_1, \ldots, b_n$ and the goal assigned to the rule r by the legislator. If so, even though H matches with $b_1, \ldots, b_n$, we do not have a violation because H should not match with $b_1, \ldots, b_n$. A non-literal interpretation of $b_1, \ldots, b_n$ would exclude H as a circumstance falling within the scope of r, since the goal of the norm would be achieved anyway: *lex magis dixit quam voluit*, the law said more than what the legislator was meaning to say. Analogously, not all cases in which H mismatches with $b_1, \ldots, b_n$ are not violations. We could have that *lex minus dixit quam voluit*, the law said less than what the legislator was meaning to say: here a non-literal, goal-based interpretation of r would lead to broaden its applicability scope to match H, thus making the agent a violator.

Example

In this section we describe the interpretation process using an example, first considering a scenario of norm restriction and second a norm expansion. Suppose Mary enters a park with her bike, thus apparently violating rule r_2 above about vehicles' circulation. Police stops her when she is still on her bike in the park and fines her. Mary thinks this is unreasonable and sues the municipality because she thinks that here the category "vehicle" should not cover bikes.

In the first case the conceptual domain T of the normative system, corresponding to a set of constitutive rules, allows us to derive that any bike a is indeed a vehicle. The goal of the norm r_2 is reducing pollution $\mathscr{G}(r_2) = \neg pollution$. In court, the judge has to establish if Mary violated r_2 or not.

If T is the case, the judge could argue that Mary should be fined, as r_2 clearly applies to her:

$$T = \{r_0 : Bike(x) \Rightarrow_c Vehicle(x),$$
$$r_3 : 2\_wheels(x), Transport(x), \neg Engine(x) \Rightarrow_c Bike(x)\}$$

But suppose that the judge can show that, if Mary's case fulfils the applicability conditions of r_2 (Mary's bike is a vehicle) then a goal which is incompatible with the goal assigned to r_2 would be promoted. Since $\mathscr{G}(r_2) = \neg pollution$, prohibiting to circulate with bikes in parks would encourage people to get around parks by car and then walk. This would be against the goal of r_2 and so the judge has good reasons to exclude that bikes are vehicles when r_2 should be applied. Accordingly, when arguing in this way, the judge may interpret r_2 by reducing its applicability conditions as far as Mary's case is concerned. He thus contracts T in order to obtain in T that Mary's bike is not a vehicle in the context of the current situation, by adding a defeater r_4 blocking the $Vehicle(x)$ conclusion: $r_4 : Bike(x), Park(y) \rightsquigarrow_c \neg Vehicle(x)$ and by stating that r_4 is stronger than r_0: $\succ = \{r_0 \succ r_4\}$.

In the second case, consider the conceptual domain T' to exclude that bikes are vehicles and the goal of r_2 could be the safety of people walking in the park (*pedestrian_safety*):

$$T' = \{r_3 : 2\_wheels(x), Transport(x), \neg Engine(x) \Rightarrow_c Bike(x),$$
$$r_5 : Bike(x) \rightsquigarrow_c Vehicle(x),$$
$$r_6 : Transport(x), \neg Engine(x) \Rightarrow_c \neg Vehicle(x)\}$$
$$\succ = \{r_6 \succ r_5\}$$

T' includes r_6, which states that, if we know that some x has purpose of transport and no engine we defeasibly derive that it is not a vehicle. However, due to r_5, if x is a bike, then we have reasons to block other rules which would lead to exclude that x is a vehicle. In T' r_6 is made weaker than r_5 via the superiority relation $\succ$.

Now, suppose the judge has to settle Mary's case starting from T'. Again, the goal of norms such as r_2 may be decisive. The judge could argue that Mary should not be fined, as r_2 clearly does not apply. But suppose that, since r_2 is not fulfilled, this would be against the goal of r_2, which is now *pedestrian_safety*. In this case, the judge has rather good reasons to consider bikes as vehicles when r_2 is concerned. Hence, the judge may interpret r_2 by broadening its applicability conditions as far as Mary's case is concerned, and so by revising T' in such a way as Mary's bike is a vehicle, i.e., by transforming r_5 in a defeasible rule: $r_5' : Bike(x) \Rightarrow_c Vehicle(x)$.

Related Work and Conclusions

In this paper we introduce a model of extensive and restrictive interpretations in statutory law. The contribution is based on the idea that the interpretation of legal concepts may require to change the counts-as rules defining them. Indeed, if our ontology does not classify a bike as a vehicle, but we have reasons that this is the case, then this implicitly leads to conclude that the ontology must be revised and that a bike, at least in the context under consideration, is a vehicle. This revision is driven and constrained by considering the goal of the norms in which these concepts occur. The full logical framework in defeasible logic, illustrating the revision mechanism, can be found in (Boella et al. In press).

In the field of normative multi-agent systems, (Grossi 2007) provides an account of counts-as rules in which the problem of the penumbra is analysed in terms of the notion of context. A 'penumbral meaning' is the set of individuals on which the contextual interpretation of the concept varies. However, (Grossi 2007) does not explain how the different extensions of a concept are dynamically related to the contexts depending on the regulative norm whose violation is discussed.

Several papers in the literature of AI & Law have considered the role of teleological reasoning in the legal interpretation. (Bench-Capon 2002; Prakken 2002) use goals and values in frameworks of case based reasoning for modelling precedents mainly in a common law context. (Skalak and Rissland 1992) analyses a number of legal arguments even in statutory law, which include cases close to the ones discussed here. The proposal which is closer to our contribution is (Hage 1997). (Hage 1997) addresses, among others, the problem of reconstructing extensive and restrictive interpretation. This is done in Reason-Based Logic, a logical formalism that can deal with rules and reasons: the idea is that the satisfaction of rules' applicability conditions is usually a reason for application of these rules, but there can also be other (and possibly competing) reasons, among which we have the goals that led the legislator to make the rules. All these approaches in AI & Law highlight the importance of rule goals, and (Hage 1997), in particular, follows this idea to formalise extensive and restrictive interpretation. However, it seems that no work so far has attempted to couple this view with a framework for reasoning with counts-as rules and their dynamics.

References

Bench-Capon, T. J. M. 2002. The missing link revisited: The role of teleology in representing legal argument. *Artif. Intell. Law* 10(1-3):79–94.

Boella, G., and van der Torre, L. 2004. Regulative and constitutive norms in normative multiagent systems. In *Procs. of 10th International Conference on the Principles of Knowledge Representation and Reasoning KR'04*, 255–265. AAAI Press.

Boella, G., and van der Torre, L. 2007. Norm negotiation in multiagent systems. *Int. Journal Coop. Inf. Syst.* 16(1):97–122.

Boella, G.; Governatori, G.; Rotolo, A.; and van der Torre, L. In press. *Lex minus dixit quam voluit*, *lex magis dixit quam voluit*: A formal study on legal compliance and interpretation. In *Procs. of 2th AI approaches to the complexity of legal systems AICOL II workshop at Jurix*, LNCS. Berlin: Springer.

Boella, G.; van der Torre, L.; and Verhagen, H., eds. 2008. *Normative Multi-agent Systems*, Special Issue of *Journal of Autonomous Agents and Multiagent Systems*, vol. 17(1).

Governatori, G., and Rotolo, A. 2008. Bio logical agents: Norms, beliefs, intentions in defeasible logic. *Autonomous Agents and Multi-Agent Systems* 17(1):36–69.

Grossi, D. 2007. *Desigining Invisible Hancuffs. Formal Investigations in Institutions and Organizations for Multi-Agent Systems*. Ph.D. Dissertation, Utrecht University.

Hage, J. 1997. *Reasoning with Rules: An Essay on Legal Reasoning and Its Underlying Logic*. Kluwer.

Prakken, H. 2002. An exercise in formalising teleological case-based reasoning. *Artificial Intelligence and Law* 10:113–133.

Sartor, G. 2005. *Legal reasoning: A cognitive approach to the law*. Dordrecht: Springer.

Searle, J. 1995. *The Construction of Social Reality*. New York: The Free Press.

Skalak, D. B., and Rissland, E. L. 1992. Arguments and cases: An inevitable intertwining. *Artificial Intelligence and Law* 1:3–44.