

Lex minus quam voluit dixit

Guido Boella¹, Guido Governatori², Antonino Rotolo³, and Leendert van der Torre⁴

¹ University of Turin, Italy

² NICTA, Australia

³ University of Bologna, Italy

⁴ University of Luxembourg, Luxembourg

1 Introduction

Logical models of legal reasoning often assume that norms give a complete description of their applicability conditions, an assumption which is too strong, due to the complexities and dynamics of the world. Norms cannot take into account all the possible conditions where they should or should not be applied, first of all because the legislator cannot consider all the possible contexts which are exceptional and he cannot foresee unexpected changes of the world [10]. Normative systems regulating real societies have two mechanisms to cope with this problem. First they distinguish regulative rules from constitutive rules. While the former, which are changed only by the legislative system, specify the ideal behavior, the latter ones provide an ontology of institutional concepts to which the conditions of regulative rules refer to. Second, the judicial system is empowered to change the constitutive norms, under some restrictions not to go beyond the purpose from which the regulative rules stem. This combination of rules and norm change allows the legislator to disentangle the specification of a behavior from the specific contexts of applicability. In this paper, we outline a logical framework which is able to capture the norm change power and at the same time the limitations of the judicial system in revising the set of constitutive rules defining the concepts on which the applicability of such a rule is based. Indeed, the distinction between regulative and constitutive rules (ontology vs norms) suggests that legal interpretation does not amount to revising norms, but to interpreting legal concepts, i.e., to revising constitutive rules [13].

While the distinction between constitutive and regulative rules has been already introduced in related computer science fields such as MAS, the interpretation process has been only addressed in the field of AI and law but only as far as it concerns case based reasoning for common law [2]. Also the relation between constitutive norms and contexts has been considered [9].

What is still lacking is a logical model of the interpretation mechanism which leads to dynamically revising constitutive norms to make the normative system flexible in multiagent systems. This issue breaks down into the following subquestions: How to model the meaning of an institutional concept? How to decide which constitutive norms to introduce to either shrink or extend the extension of the institutional concept? How to reason about the interaction between norms and goals?

The methodology we use is to adopt an extension of Defeasible Logic [5], which allows us to model constitutive and regulative norms, the goals associated to norms and the norm change process.

2 Legal Rules and Legal Concepts

Consider a trial where the plaintiff and the defendant propose to the judge arguments against or in favour of the defendant, who is accused to have violated a given legal rule. The dispute is resolved by a judge who is required to interpret the rule by redefining its applicability conditions. This means that the judge will have to revise the definition of the institutional concepts to which the rule refers. In doing so, the judge will have to take a decision based on the goal attributed as a reason for the existence of the legal rule.

To formally capture the basic mechanism behind the interpretation of legal concepts we need to devise a reasoning framework consisting of the following components:

- a mechanism for reasoning about legal concepts;
- a mechanism for reasoning about legal rules, imposing duties and prohibitions;
- a mechanism for reasoning about the goal of legal rules.

The general idea behind this framework is that legal rules state what is obligatory and prohibited for the agents. In other words, they provide normative constraints for agent behaviour and we assume that no agent can change them (agents are not legislators). Legal concepts constitute the content of legal rules; in particular, they qualify their applicability conditions. Finally, as usually assumed in legal theory [12, 11], we assign goals to legal rules. In the social delegation cycle [4] 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. We have two cases. First, a legal rule can be applied in a given situation, but if the norm were respected in that situation, the goal of the norm would be endangered by this. Second, a legal rule cannot be applied in a concrete case, but this situation lead to undermining the goal which such a rule is suppose to promote.

In both cases, an interpretation of the applicability of a norm by the judicial system is limited by the goal the legislator was aiming to when he devised the norm. Note that the goal alone would not be sufficient, since there could be many ways to achieve that goals. Thus, the norm works like a partial plan the legislator set up in advance. The judicial system is left with the task of dynamically adapt the applicability of the norm by revising the constitutive norms, in order to fulfill the goal of the norm also under unforeseen circumstances.

In this paper we adopt the view that legal concepts are built via constitutive rules having the so-called counts-as form [14]. For example, a common legal definition of holographic wills requires that they have been entirely handwritten and signed by the testator:

$$r_1 : \text{HandWritten_Will}(x), \text{Signed_Testator}(x) \Rightarrow_c \\ \Rightarrow_c \text{Holographic_Will}(x)$$

This counts-as rule, if instantiated by any individual a , says that a counts as a holographic will if a has been entirely handwritten and signed by the testator.

In general, note that in legal systems counts-as rules may either specify conceptual links between “brute” facts or acts (i.e., non-institutional facts or acts whose status is independent of the existence of any constitutive rule; example: being over 18 years) counts as types of institutional facts or acts (e.g., being adult), or rather specify conceptual links where institutional facts or acts (e.g., a contract made by person j in the name of person k) have the same effects of other institutional facts or acts (e.g., a contract made by k). This view basically implies that the consequents of constitutive rules always correspond to institutional facts or acts. Indeed, constitutive rules are meant to “constitute” and define legal concepts whose existence precisely depends on the existence of constitutive rules.

In this paper, we will deal with such a type of constitutive rules following the approach described in [6], where it is convincingly argued that an effective way to capture the basic properties of the counts-as link is to reframe it in terms of standard Defeasible Logic. This will be our starting point, as there is no room here for discussing any alternative option among those recently proposed in the literature.

The set of legal rules is kept to be fixed. In other words, any interpreter can argue about their applicability conditions but cannot either add new rules nor cancel them.

Legal rules will have the following form:

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

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

$$r_3 : \text{Resident_Italy}(x) \Rightarrow_O \text{Pay_Taxes}(x)$$

states that if x is resident in Italy, then x has to pay taxes to the Italian government.

For the sake of simplicity, we will assume that legal rules only impose duties and prohibitions and are captured within a suitable extension of standard Defeasible Logic [5]. (permissions can be easily captured here in terms of special rules for permission [5, 8]. See [8] to see how to capture other legal qualifications different from obligations and prohibitions.)

We will then define a set Goal of goals and a function \mathcal{G} which maps legal rules into elements of Goal. For example, if $\mathcal{G}(r_2) = \mathbf{Road_Safety}$, this means that the goal of the rule prohibiting to enter into parks is to promote road safety¹. The idea is quite standard in legal theory [13, 11, 12] and has been already investigated in AI&Law, even though most works were mainly devoted to case-based reasoning and modeling case-law [2]. A similar idea has been recently proposed in the field of normative MAS by [4], where it has been argued that norms derive from goals. In general, note that, for simplicity, goals are considered here as directly specified by the legal rules themselves, even though it is sometimes a hard task to determine what goals are suppose to be promoted by rules, a task which is usually accomplished by judges by developing suitable arguments during the trial.

As largely acknowledged in legal theory, when it is possible to establish the relative weight of rule goals, this can be used both to determine the relative strength of any legal rule in case of conflicts with other rules and to interpret any legal rule when it is not clear whether this rule can be applied to a given concrete case [11]. As regards the first issue—solving conflicts by referring to rule goals—it seems natural then to define a partial order $>$ over Goal to capture cases where any goal g is more important than any other goal g' . If $g > g'$ then g is more important than g' , otherwise they have equal importance. Hence, $>$ may be used to solve conflicts between legal rules. Consider the following rules:

$$\begin{aligned} r_4 &: \mathit{HighWay}(x), \neg \mathit{Authorized_Area}(x) \Rightarrow_O \neg \mathit{Stop}(x) \\ r_5 &: \mathit{HighWay}(x), \neg \mathit{Authorized_Area}(x), \mathit{Crash}(y) \Rightarrow_O \mathit{Stop}(x) \end{aligned}$$

Rule r_4 states that it is forbidden for drivers to stop in highways except in authorized areas; rule r_5 says that drivers have to stop when they are responsible for serious car crashes in highways. Suppose that the legal system does not explicitly state what rule should prevail here. If so, resorting to rule goals can help. In fact, we may assume that the goal of r_4 is to promote road safety, while the one of r_5 is to protect life when it is in serious and imminent danger. Since the latter goal should be more important than the former one, r_5 will have to prevail over r_4 .

This mechanism for solving conflicts will be added in our framework to the standard one adopted in Defeasible Logic [1], which is based on a superiority relation \succ directly applied to rules. (And which can be relevant in our framework when, for example, two conflicting rules have the same goal.)

3 Interpreting Legal Rules

Consider again rule r_2 :

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

Suppose Mary enters a park with her bike, thus apparently violating rule r_2 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 the case of bikes.

We may have here two main alternatives. The first is that the conceptual domain of the normative system, corresponding to a set of constitutive rules, allows for deriving that any bike b is indeed a vehicle:

$$\begin{aligned} T = \{ & r_6 : 2_wheels(x), \mathit{Transport}(x) \Rightarrow_c \mathit{Bike}(x), \\ & r_7 : \mathit{Bike}(x) \Rightarrow_c \mathit{Vehicle}(x) \} \end{aligned}$$

¹ Hereafter, we will use bold type expressions to denote goals.

Alternatively, the conceptual domain could exclude that bikes are vehicles:

$$\begin{aligned}
 T' = & \{r_6 : 2_wheels(x), Transport(x) \Rightarrow_c Bike(x), \\
 & r_8 : Bike(x) \Rightarrow_c \neg Vehicle(x), \\
 & r_9 : Transport(x) \rightsquigarrow_c Vehicle(x)\} \\
 \succ = & \{r_8 \succ r_9\}
 \end{aligned}$$

Note that T' also includes r_9 , which is a defeater: as usual in Defeasible Logic, rules like this are meant not to derive conclusions, but to provide reasons against the opposite. In other words, r_9 states that, if we know that some x has purpose of transport, then we have reasons to block other rules which would lead to exclude that x is a vehicle. However, in T' r_9 is made weaker than r_8 via the superiority relation \succ , and so, if x is a bike, we conclude that x is not a vehicle.

Now, suppose the judge has to settle Mary's case. Here, the goal of legal rules such as r_2 may be decisive.

Indeed, if T is the case, the judge could argue that Mary should be fined, as r_2 clearly applies to her. But suppose that we can show that, if Mary's case fulfils the applicability conditions of r_2 (Mary's bike is a vehicle) then we should promote a goal which is incompatible with the goal assigned to r_2 . For instance, if $\mathcal{G}(r_2) = \neg\text{pollution}$, prohibiting to circulate with bikes in parks would encourage people to get around parks by car and then walk. Hence, if we assume r_2 is fulfilled, 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, and so by contracting T in order to obtain in T that Mary's bike is not a vehicle.

Suppose now that T' is the case. Here, the judge could argue that Mary should not be fined, as r_2 clearly does not apply. But suppose that, if 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.

In general, we should note that such types of revisions have to satisfy some requirements (let's still bear in mind the case of Mary's bike):

1. there is no other $g' \in \text{Goal}$ such that
 - the revision of T (or of T') promotes r_2 's goal g which is incompatible, in the application context of r_2 , with respect to the goal g' of another applicable rule r_3 , and
 - $\mathcal{G}(r_2) \not\prec \mathcal{G}(r_3)$;
2. our set of constitutive rules should suggest us that the concept of *Bike* can be subsumed under the concept of *Vehicle*.

Point 1 above states that, if by contracting or revising the concept of *Bike*, we undermine at least one equally or more important goal, which is supposed to be promoted by another applicable rule, then such a contraction or revision is not acceptable. This limit is well-known by lawyers and legal theorists [12, 11], who often argue that any legal interpretation should be coherent within the legal system as a whole.

Point 2 above is rather connected with the fact that the set of constitutive rules should inherently provide some conceptual limits for any interpretation. Indeed, suppose that Mary enters the park with a gun. We could have reasons for arguing that entering with a gun is dangerous for all people in the park, and so for pedestrians too. However, this is not enough, of course, for arguing that guns are vehicle. In other words, if we do not have any other legal rules prohibiting to enter parks with guns, this behaviour will be permitted. Hence, point 2 has to do with Hart's [?] theory of penumbra: we have a core of cases which can be clearly classified as belonging to the legal concept and a penumbra of hard cases, whole membership in the concept can be disputed; but hard cases should exhibit some conceptual link with the core of cases. This idea is

formally captured here by confining the revision of the set of constitutive rules only to those situations where such a set, though failing to prove that a bike is a vehicle, already contains reasoning chains suggesting that this may be the case. For example, if we have

$$\begin{aligned} r_6 &: 2_wheels(x), Transport(x) \Rightarrow_c Bike(x) \\ r_{10} &: Bike(x) \rightsquigarrow_c Vehicle(x) \end{aligned}$$

r_{10} states that, if we know that some x is a bike, this is not sufficient to prove that x is a vehicle (r_{10} is a defeater), but it is sufficient to block other rules which would lead to exclude that x is a vehicle. However, this means that, possibly, if x is a bike, then it could not be unreasonable to consider x as a vehicle (for a similar reading of defeaters in terms of \diamond , but applied to the concept of permission, see [8, 5]). Hence, the revision would require, for example, that r_{10} is replaced by

$$r'_{10} : Bike(x) \Rightarrow_c Vehicle(x)$$

4 Reasoning about Rule Goals

The framework we have informally depicted in the previous sections suggests that we also need a logical component to reason about rule goals. Such a component should enable us to check whether some situations promote rule goals or their negations. Developing a comprehensive and complete account of these reasoning patterns is out of the scope of this paper, as this would require to address complex research issues in the field of causal reasoning which have been extensively investigated in the AI literature (see [?] for a general discussion of this issue in the legal domain). Hence, we do not exclude that other and more sophisticated formalisms can be used as an external component to reason about rule goals.

To provide the reader with a complete picture of how the system works, we explicitly add in our framework such a reasoning component: our approach in this regard is rather simple and follows some intuitions provided in [6]. For the purpose of this contribution it is sufficient to introduce a suitable set of rules for goals which should be used to establish what are the effects of situations where legal rules are violated or complied with, and, in doing so, to see whether they are consistent with the rule goals. In other words, we have to devise a set of rules like $d_1, \dots, d_n \Rightarrow_G e$: if applicable in a given context D , this rule allows for deriving Ge , meaning that e is a goal promoted by D . Consider once again rule r_2 :

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

Suppose that its goal is **pedestrian_safety** and that Mary's case is described by the following set H of facts:

$$\begin{aligned} H = \{ & Bike(b), Park(p), Enter(b, p) \\ & NarrowSpace(p), UnprotectedChildrenArea(p) \} \end{aligned}$$

H states that Mary enters the park p with her bike b . The park has narrow spaces for walking and there are unprotected children's play areas. This set assumes that r_2 is violated, at least in the hypothetical perspective in which Mary could not enter.

Suppose now that rules for goals correspond to the following set:

$$\begin{aligned} R^G = \{ & r_{11} : Bike(x), Park(y), Enter(x, y) \Rightarrow_G \mathbf{fast_circulation} \\ & r_{12} : NarrowSpace(x), UnprotectedChildrenArea(x), \\ & \mathbf{Gfast_circulation} \Rightarrow_G \neg \mathbf{pedestrian_safety} \} \end{aligned}$$

Rule r_{11} states that entering parks with bikes promotes the fast circulation of people in those parks; rule r_{12} says that, if fast circulation is promoted and parks have narrow spaces and unprotected children's play areas, then the promoted goal is the negation of pedestrians safety. If so, if Mary's bike is allowed to enter, then we would promote a goal which is incompatible with the goal of r_2 .

5 Summary

Normative systems in open multiagent systems have proven a suitable methodology for regulating emergent behavior. However, the norm metaphor is not completely applied in that norms are applied without any flexibility. This limitation is severe, in that it does not leave the system the flexibility to adapt to unforeseen or unpredictable circumstances.

In this paper, we borrow from normative systems in human reality the structure and dynamics to overcome such limitation. We distinguish between constitutive and regulative rules, to disentangle what is obligatory or forbidden from the applicability conditions of such obligations and prohibitions. We allow the judicial system to change the constitutive norms, to ensure that the applicability of norms is adapted dynamically. At the same time, we limit the powers of the judicial system by using as a constraint the goal that the legislator aims at fulfilling when he creates a norm.

Future work is to model the argumentation process between prosecutor and defendant about the applicability of a norm, to improve the recognition of which concepts should be extended or contracted to apply a norm, and to formalize the norm change process [3, 7].

References

1. Grigoris Antoniou, David Billington, Guido Governatori, and Michael J. Maher. Representation results for defeasible logic. *ACM Trans. Comput. Log.*, 2(2):255–287, 2001.
2. Trevor J. M. Bench-Capon. The missing link revisited: The role of teleology in representing legal argument. *Artif. Intell. Law*, 10(1-3):79–94, 2002.
3. G. Boella, G. Pigozzi, and L. van der Torre. Normative framework for normative system change. In *8th International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS 2009)*, pages 169–176, 2009.
4. G. Boella and L. van der Torre. Norm negotiation in multiagent systems. *International Journal of Cooperative Information Systems (IJCIS) Special Issue: Emergent Agent Societies*, 16(1):97–122, 2007.
5. G. Governatori and A. Rotolo. Bio logical agents: Norms, beliefs, intentions in defeasible logic. *Autonomous Agents and Multi-Agent Systems*, 17(1):36–69, 2008.
6. G. Governatori and A. Rotolo. A computational framework for institutional agency. *Artif. Intell. Law*, 16(1):25–52, 2008.
7. G. Governatori and A. Rotolo. Changing legal systems: Legal abrogations and annulments in defeasible logic. *Logic Journal of the IGPL*, 2010.
8. G. Governatori, A. Rotolo, and G. Sartor. Temporalised normative positions in defeasible logic. In *The Tenth International Conference on Artificial Intelligence and Law*, pages 25–34. ACM, 2005.
9. D. Grossi, J.J. Meyer, and F. Dignum. The many faces of counts-as: A formal analysis of constitutive rules. *J. Applied Logic*, 6(2):192–217, 2008.
10. H.L.A. Hart. Positivism and the separation of law and morals. *Harvard Law Review*, 71(4):593–629, 1958.
11. Aleksander Peczenik. *On law and reason*. Kluwer, 1989.
12. Giovanni Sartor. *Legal reasoning: A cognitive approach to the law*. Springer, 2005.
13. Giovanni Sartor. Fundamental legal concepts: A formal and teleological characterisation. *Artif. Intell. Law*, 14(1-2):101–142, 2006.
14. J.R. Searle. *The Construction of Social Reality*. The Free Press, New York, 1995.