On the Ontological Status of Norms

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Abstract. This article describes an ontological model of norms. The basic assumption is that a substantial part of a legal system is grounded on the concept of *agency*. Since a legal system aims at regulating a society, then its goal can be achieved only by affecting the behavior of the members of the society. We assume that a society is made up of *agents* (which can be individuals, institutions, software programs, etc.), that agents have beliefs, goals and preferences, and that they commit to intentions in order to choose a line of behavior. The role of norms, within a legal system, is to specify how and when the chosen behavior agrees with the basic principles of the legal system. In this article, we show how a model based on plans can be the basis for the ontological representation of norms, linking them to the upper level of a philosophically well-founded ontology (DOLCE); in this way, the model is set in a wider perspective, which opens the way to further developments.

1 Introduction

The goal of this article is to describe a proposal concerning the proper place of legal rules in a well founded ontological framework. Since the role of ontologies in computer science is to support knowledge sharing both among computer systems and between computers and humans, it is important that it represent the world as it is conceived by sentient beings (so that epistemology is possibly a term that is more suitable to the matter at hand [8]).

In this article, we do not aim at covering the ontological status of all types of rules. For instance, in a legal system, there are rules concerning the definition of concepts (e.g. Non Governative Organization) with which we are not concerned (we assume they are given in advance). But we are (at least partially) concerned with institutional roles and their attributions, since institutional roles, as authorities, are a (predefined) category of people, and their attributions define what they can and cannot do. Also, we are not concerned with the way a Court gives a verdict, which is a very complex process, but we are concerned with the presence, in the ontology, of all the concepts required to describe the facts and the evidence available to the court. In other words, this paper faces a

small but relevant fraction of legal knowledge¹: it covers the norms of conduct, i.e. the norms that specify what a legal actor can and cannot do. The claim is that these rules express constraints on actions, and their relevance stands on the view that a legal system aims at organizing a society in such a way that the rights and duties of individuals and organizations are properly balanced, on the basis of superior principles.

We also aim at showing how norms affect behaviour. The formalization of prescriptive rules is assumed to be available to an agent that must do things, and that must choose what to do: this agent uses the rules to decide what he will do next; in principle, he will choose a line of action that complies with the existing rules, but in some cases he may decide that a rule is not worth being respected, either because it is in conflict with other norms, or because the risk of being sanctioned is low. Beyond moral concerns, this is the way many rational agents choose to act: it must be properly modelled, since it explicitly includes the concept of sanction, and, implicitly, guides the legislator to properly choose the sanction associated with a given rule.

The paper is organized as follows: the next section presents the upper-level of the ontology (DOLCE), and our formalization of plans; in the third section, the representation of norms is described; the fourth section shows how power and authorities fit our approach; in Section 5, we present a case study addressing the legal concept of ‘goods’; then, we compare our approach with other ontological models of the legal systems; the conclusions close the paper.

2 The Upper-Level of DOLCE, and the Plans

We chose DOLCE because of the clear philosophical foundation of its basic categories [9]: they have been selected as the result of a research effort that has lasted for some years, and the motivations for the final choices can be found in the referenced papers [10,11,29]. Most of the structures addressed in the paper are based on the KIF implementation reported in [19].

Without any details, we report here some brief comments on the top-level of DOLCE, which seem necessary in order to explain the connections to plans and norms. Some of the concepts defined in DOLCE are depicted in fig.1.

The upper-level categories are *Abstract*, *Quality*, *Situation*, *Endurant*, and *Perdurant*. The assumption about the existence of abstract entities and qualities is rather common (with the known philosophical intricacies). The distinction between *Endurants*² and *Perdurants* can be specified by citing the authors: “Endurants are wholly present (i.e. all their proper parts are present) at any time they are present. Perdurants, on the other hand, just extend in time by accumulating different temporal parts, so that, at any time they are present, they are

¹ “Since the norm is the most salient construct of the legal domain, we have selected it as the point of departure for our intermediate representation” [17], p.1128.

² In the text, we sometime use the category names in the plural. Although this is imprecise, we believe it makes the reading more fluent.

Fig. 1. A portion of the upper level of DOLCE (from [19])

only partially present, in the sense that some of their proper temporal parts (...) may be not present” [9], §2.1.

Situations “satisfy” *S-Descriptions* (situation description), a subcategory of *Descriptions*; the latter, are a subcategory of *Non-Physical-Endurants* (see fig.1). So, a situation is the ‘actual’ counterpart of a representation (description).

Descriptions are particularly important in this article, since, in DOLCE, plans are *S-Descriptions*. So, *Plans* are particular descriptions of situations. This placement reflects a view where plans describe something; although we would rather take a plan as the situation which is described, in order to maintain the compatibility with DOLCE, we focus in this article on the description(s) which an agent is reasoning about while he is trying to decide what to do (one or more partially specified *plan schemas*), rather than to the *execution of a plan*, i.e. the actual, real-world, events that the agent carries out. From this point of view, a plan can be imagined as a tree-like structure, where some decisions have been already taken, while others are suspended. For example, I may know about plans for travelling to far cities. And I may have the goal of being in Rome tomorrow. So I can examine the plans “go to a far city by train” and “go to a far city by plane” (two different plan schemas). If I have chosen the second schema, then I have certainly fixed the ‘airport of arrival’ and the ‘airport of departure’ (i.e. two of the participants in the plan), but, possibly, the departure time is just given as ‘some time in the morning of tomorrow before 8.00 a.m.’ (i.e. underspecified).

We assume that for each *Plan*, a set of *p-preconditions* and a set of *p-effects* are defined; their range is *S-Description*. This is different from DOLCE, where *precondition* is a relation between *S-Descriptions* and *situations*. We believe that is more homogeneous to maintain a relation between *S-Descriptions*; of course, the *S-Description* which acts as *p-precondition* will be *satisfied-by* DOLCE’s *precondition*. For example, the plan of going Rome by plane is executable if the *S-Description* “The Rome Airport is open” is satisfied by the current *Situation*. Furthermore, we assume that each *Plan* has some *s-participant*. They are the entities involved in the plan, but need not be completely specified (I will take a *taxi*, I will take a *yellow taxi with an old, experienced driver*).³

Plans are the objects managed in the process of planning. The idea is that there is a *Perdurant* called *Thinking*, which has as participants the descriptions

³ Of course, many features of the plan ontology have been left out, but the goal of this paper is just to address the role of plans in the representation of norms.

embodied in the brain. In particular, *Planning* is that type of *Thinking* that works upon the mental representation of plans. It produces new *Plans* by considering⁴ known *Plans* (going to Rome by bus), by specializing existing *Plans* (the taxi company has been chosen), or by discarding *Plans*. The final outcome of this process is that a plan has become an *Intention*. No *Intention* concept is currently defined in DOLCE, but *has-BDI-on* is a *modality-target* relation holding between an *Agent-role* and a *Course* (of events). specific type of *Course*, we call *Intention* the role assumed by the sequence of *Tasks* which the planning agent has chosen. Correspondingly, we call *has-intention-on* the subrelation of *has-BDI-on* which refers to intentions (wrt. beliefs and desires).

But what is the role of *Intention*? Agents always act: if the current time is t_i , then agent A is doing something at t_i and will try to do something at t_{i+1} ; that something is specified by A 's current intention. Since, during planning, an agent considers many *Plans*, but just one of them becomes his *Intention*, he needs some way to decide which *Plan* is the best. In our model, we assume that:

- The choice is based on the agent's *preferences*;
- The preferences are applied to states that can be originated (either directly or indirectly) by the execution of the plan;
- From a computational point of view, applying the preferences to a state amounts to evaluating the *utility* of that state;

In our view, these criteria characterize the *rationality* of agents. The use of utilities in the planning activity has been described elsewhere [5]. Here, some comments are needed on the second point. In fact, the reason why preferences are not necessarily applied to (i.e. the utility is not necessarily evaluated on) the state directly resulting from the execution of the plan, is one if the key features of our approach to norms.

In general, the execution of a plan has certain effects on the environment (*p-effects*). But this new situation can also produce further foreseeable changes. This is especially true in case the world is populated by other agents, who may interact with the planning agent. So, the agent must try to imagine how the world would be after some sequence of reactions from the environment. So, the utility of a plan is evaluated on the basis of the state that obtains after the execution of the plan, and after some re-actions of the environment to the resulting state (we assume here a two-level lookahead: plan execution + reaction). The major point is that the environment is assumed to be able to react to the breach of norms; so, in order to model the behaviour of an agent, we need a way to specify how the environment reacts to such a situation. Note that we have used the very general term 'environment'; this leaves unspecified which are the relevant components of such an environment. Currently, we assume the existence of a *Normative-Agent-Role*, who has to enforce the respect of law (he can be a single individual, as a policeman, or a social body). Note that the presence of normative

⁴ By 'considering', we mean here the process of moving around (e.g. from LTM to STM) pieces of descriptions.

agents does not exclude that the respect of a norm is a value ‘per se’ (embodied in preferences of the agent).

3 Norms

In DOLCE, *Norm* is a subcategory of *Regulation*: *Norms* have the function of constraining *Perdurants*. In order to explain our approach to norms, let us introduce an example. As we have seen, a *Plan* has *p-preconditions* and *p-effects*. The *p-preconditions* of a plan schema pose some constraints on the applicability of the plan. The *p-preconditions* for cooking spaghetti with garlic, oil, and chili pepper (GO&CP), is to have spaghetti, oil, chili pepper, water, a pan, and some fire (a very easy recipe). As usual, *p-preconditions* are (physical or practical) conditions that prevent the action from being executable. But it could happen that the King of ThatKingdom has prohibited this recipe. Or, perhaps, this prohibition applies just to dinners with more than 7 participants, or to dinners served after midnight, and so on. Also, in some situations (here and now) garlic could not be a nice ingredient (because of its side-effects on your breath); or you know that one of your guests does not like chili pepper. All of these are not *p-preconditions*: if you have all the things you need, you can cook them in all situations described above. Anyway, these rules constrain your freedom to cook spaghetti GO&CP; you can pay for that: the King may imprison you, or your guests may decide that they will never accept another invitation from you.

The “norms” we have exemplified above are not *p-preconditions*, but constraints on plans. We stress that in all of these examples, the utility of that recipe is reduced by the presence of the norm, so, it is possible that in absence of the norms, your intention for tonight dinner is to cook spaghetti GO&CP, but in presence of one or more of these norms, your intention is to prepare rice

Fig. 2. Norms and Plans: an example

with mushrooms: you have chosen a different plan, whose utility is lower than the plan of spaghetti without norms, but is higher than the plan of spaghetti with norms (since the violation of the norm reduces the utility). The problem, now, is how to express the norms.

Let us consider the case of the King's prohibition in its basic form (independent of the number of participants and of daytime). The rule involves three or four elements: the involved plan, the authority who posed the norm, and the agent who is taken as responsible for the execution of the action; the fourth element is not strictly required, but it is very common: it is the sanction⁵ the agent will undergo in case he does not respect the rule. So, a norm is not a plan, but 'refers' to a plan, in the sense that it (as a description) includes (is related to) a description of the action (i.e. the plan) which is forbidden (or permitted).

In fig.2, we introduce the basic notions related to norms, and apply them to our spaghetti example. In the figure, it is stated that

1. *Norms* are a subcategory of *S-Description* (thick arrow).
2. *Norms* have a *topic*⁶, the *Plan* the norm is about (thin arrows with squares are relations).
3. *Norms* have a *polarity*. Its range is the abstract set composed of the two elements *pos* and *neg*. If the value is *pos*, then the norm refers to something an agent must do, otherwise it refers to something he must not do.
4. Every *Norm* has a *bearer*. More precisely, it has a set of bearers: usually, norms apply to categories of agents, and not to single individuals.
5. Every *Plan* has an *actor*, who is the 'main character' of the plan. Although the *actor* of the plan is conceptually distinct from the planning agent, currently we assume that the two roles are played by the same individual.
6. The *actor* of a plan, if that plan happens to be the *topic* of the *Norm*, and if that *actor* is of the right category, becomes an (individual) *bearer* of the rule (dotted diamonds are constraints on relations; here, it is said that the *actor* of the *topic* of the *Norm* is equal to the *bearer* of the *Norm*).
7. Every *Norm* is associated with a *sanction*⁷, which is a *PlanWithPatient* (the subclass of *Plan* which is in some *has-patient* relation with an individual playing a *Patient-Role*).
8. There is a specific subcategory of *Norm* called *Duty* (see [2,4,15]).
9. The *bearer* of the *Norm* is the *has-patient* of its *sanction*. Of course, this does not take into account the notion of *responsibility*, but we assume that being an agent who freely chose a given line of behavior is the basis for further elaborations of this concept.
10. The *author* of a *norm* is an *Authority* (see Section 6).
11. *ToImprison*, *Go&CP*, *NoSpaghettiGO&CP*, are individual instances of *Plan-WithPatient*, *Plan*, and *Norm*, respectively (boxes are instances linked to their class via dotted arrows).

⁵ For different positions on the role of sanctions in law, see [13,16].

⁶ The term *topic* is inspired to Ross [22]'s "theme".

⁷ We are dealing here with 'normative' rules. In other cases, the sanction may be replaced by a reward.

4 Authorities

Traditionally, legal scholars like [13] distinguish between primary laws, whose purpose is to direct the behavior of citizens, and secondary laws, which serve, among other functions, to the maintenance and dynamic management of the normative system. These rules form a “subsystem of rules for change”: rules which have legal effects and which are instrumental to the primary system, in that they regulate the regulation (e.g., art. 2 of Italian Civil Code: “the creation of laws [...] is regulated by constitutional laws (Cost. 70)”). This subsystem, according to Hart, does not include only the rules of change which specify how new laws are introduced or old ones removed, but it also includes rules about “powers for the private citizen”.

It seems reasonable to consider all these rules, which correspond to what Hohfeld calls *Power* as somewhat akin to a *Privilege*. Since *Privileges* are assumed to be a special kind of *Norms*, also *Powers* are seen as particular subcategories of *Norm*. In particular, we introduce *JurPlans* and *LawPlans*⁸: *JurPlans* establish new *IndividualConstraintsOnBehavior*, while *LawPlans* establish new *Norms*. An example of *JurPlan* is ‘renting a car’, where, if the plan is executed correctly and by a person who can do it (according to an existing *BasicPower* norm), new *IndividualConstraintsOnBehavior* are set up, regulating the behavior of the two parties (duties and privileges of the renter and of the client). On the contrary, the introduction of a new norm stating that only people older than 20 may rent a car is the execution of a *LawPlan*.

Of course, not every agent may execute *JurPlans* or *LawPlans*. An agent who can do that is said to have *Power*. For example, the owner of a car rental agency has the *Power* to rent a car, and, according to the hypothetical rule mentioned above, anybody older than 20 (with a driving license) has the *Power* to hire a car. Both of these *Powers* are *BasicPowers*, since they enable the execution of plans that establish individual duties. On the contrary, only people (or institutions) having some *LawPower* can modify the minimal age for renting a car, since this implies a modification of the legal system. The result of this conceptual analysis is depicted in fig.3.

In principle, *Power* does not tell us very much: there is some action that an agent can perform that has some effect concerning Legal Relations. But, apart from the final qualification about the type of effect, this is true for every action: this is the very definition of an action (or a plan, if the action is complex). So, it is sufficient that such an action be defined, in order to obtain *Power*: if the action does not exist, then no *Power* exists; if the action does exist, then there is the *Power*; but provided that the preconditions are satisfied! And the origin of *Power* seems to be in the preconditions. Usually, they express factual constraints: if there is no lamp, you cannot turn the light on. But in this case, preconditions are ‘conventional’, in the sense that even if they do not hold, the

⁸ This is consistent with [13], p.33, who characterizes power-conferring norms as recipes for creating duties.

5 A Case Study: Fruits

In this section, we report the result of a preliminary study on a legal concept, i.e. fruits (see Italian Civil Code, art. 820). A *Fruit* is something that is obtained by somebody as the result of his ownership of something else. For instance, you obtain the apples if you own an apple tree, you obtain some money if you own a house and you rent it out. Notice that the presence of fruits does not affect the ownership of the thing.

5.1 Goods

Goods are defined as a subcategory of *Endurants*¹⁰. We partition the goods in two subcategories: those goods that may undergo a property relation (*SubjectToProperty*), and those which cannot (*NotSubjectToProperty*). The individuals of the first category can play two roles: goods that, at some time, are owned by somebody (*Asset*), and goods which are temporarily not owned by anybody (*ResNullius*). The *PropertyRel* relation involves a *Legally-Constructed-Person* (the *owner*) and a *SubjectToProperty* good (the owned thing: *ownee*). An *Asset* is the *object* of a *SubjectToProperty* good, for which there is a *PropertyRel* relation. On the contrary, a *ResNullius* is not involved in any *PropertyRel*.

5.2 Fruits

Fruits are *Goods*. There are two types of *Fruits*: *NaturalFruits* and *CivilFruits*. *NaturalFruits* are goods that are “detachable” parts of some “original” good, and which originated out of the original good via some natural process (e.g. the growth of apples, peaches, etc. – the birth of a lamb out of its mother, etc.). In this paper, we will not discuss natural fruits any more.

On the contrary, *CivilFruits* are *Assets*, which have changed their *owner*. The general idea is that some agent *A1* owns (and possesses) some *Good G1*; then, he can decide to exchange the possession (maintaining the ownership) against some *Good G2*, usually for a limited period of time. A second agent *A2* gets the possession of *G1* and gives *G2* to the first agent. In this situation, *G2* is a *CivilFruit* of *G1*. The simplest example is that of (house) rental, where *G1* is the rented house, *A1* is the owner of the house, *A2* is the tenant and *G2* (the *CivilFruit*) is the amount paid for the rent. All of this is ruled by some *JurPlan* (as a *Contract*), which must be executed by the involved parties (*A1* and *A2*). As seen before, in order to be authorized to execute a *JurPlan*, an agent must have some *JurPower*. In the example of house rental, this power has been given to the owner *A1* by the original act of buying the house. On the contrary, the power exercised by *A2* is due just to his being a *Legally-Constructed-Person*,

¹⁰ As one referee pointed to us, the specification of what may constitute a *Good* from a legal point of view requires a more careful analysis. Since the focus of this example is on *Fruits*, and, at least in principle, any *Good* can produce *Fruits*, we leave open the problem of a better characterization of *Goods*.

Fig. 4. Fruits

and to his power over the money he pays for the rental. Of course, all of this produces new legal relations, in particular, new *Privileges* for *A2*; these are the *Privileges* associated with the *Possession* relation, which has been created as an effect of the execution of the *Rent* contract.

In fig.4, we have depicted some of the concepts discussed above. In particular, it has been made explicit that:

1. *CivilFruit*, since it is an *Asset*, has a *owner* (linked to it via the *PropertyRel* concept).
2. *CivilFruits* come from some other *Good*, which we have called *ExploitedGood*.
3. The *owner* of the *ExploitedGood* is the same as the *owner* of the *CivilFruit*.
4. There exists a special type of *Contract* involving exactly two contractors (*Contract#2*).
5. A subtype of type of *Contract#2* is *FruitProducingContract*. The two contractors are called the *giver* and the *receiver*.
6. *FruitProducingContract* involves two *Goods*, called the *primary* and the *secondary*.
7. A first *effect* of a *FruitProducingContract* is that a new instance of the *Possess* relation is created (*PossessX* in the figure).
8. A second *effect* of a *FruitProducingContract* is that a new instance of *PropertyRel* (*PropertyY*) is established.
9. The *owner* of *PropertyY* is the *giver* of the *FruitProducingContract* which produced the creation of *PropertyY*, while the *ownee* of *PropertyY* is the *secondary* of *FruitProducingContract*.

10. The *primary* of *FruitProducingContract*, which is an *Asset*, as an effect of an execution of *FruitProducingContract* takes the material role of *ExploitedGood*, as well as the *secondary* takes the role of *CivilFruit*.

This is just a simple example, but it makes explicit that there is no *CivilFruit* without an *ExploitedGood* (item 2), and it specifies how *CivilFruits* come into being (item 10). What can easily be made is to introduce *specializations* of *FruitProducingContract*. So, we can have *ApartmentRental*, *LandRental*, *BankDeposit*, etc. all of which inherit the general features of *FruitProducingContract*. In particular, all of them share the effect that some *Asset* becomes a *CivilFruit*.

5.3 A Norm on Fruits

As an example of norms concerning fruits, we consider part of the article 1477 of the Italian Civil Code: the seller must give the buyer the possible fruits produced by the sold asset (the *ExploitedGood*). More precisely, if the *owner* of a *Good*, which is currently playing the role of *ExploitedGood* sells that *Good*, then also the associated *Fruits* must be given to the buyer.

Fig. 5. A norm about selling *ExploitedGoods*

Fig.5 shows the relevant part of the representation. The focus of the example is the *Norm* instance *Give-FruitW*, which is a *Duty* that comes into being as an effect of the execution of *SellExploitedGood*, which is a *JurPlan*. This instance is analogous to the instance of *Property* that refers to the fact that the buyer is now the owner of the sold item, in the sense that both of them are effects of a selling action. Note also that the *Norm* mentioned in the previous paragraph is not represented explicitly, since it is actually part of the definition of the *Power* associated with the definition of *SellExploitedGood*. In fact, as stated in Section 4, the issuer of the Italian c.c. article 1477 had the power to (implicitly) define the *SellExploitedGood* action (although no name was given to it). Within this definition, the effect of creating the *Duty* of transferring the *CivilFruits* was included, and this is what is depicted in the figure.

1. *Selling* is a specific type of *Contract#2* (and hence a *JurPlan*).
2. Among the effects produced by *Selling* there is a change of *Property*: a new instance of *Property* is established (shown in the figure) while a previous property is cancelled (not shown in the figure).
3. When the sold *item* is an *ExploitedGood*, a specific subcategory of *Sell* is defined: *SellExploitedGood*.
4. Beyond the (inherited) effects produced by *Sell*, *SellExploitedGood* produces a further *effect*: a new *Duty* (*Give-fruitW*). The *bearer* is the same legal subject who plays the role of *seller* of the *Selling* action; this does not need to be specified explicitly, since it is inferred from the general rule that the *bearer* is the *has-agent* of the *topic* of the *Norm* (i.e. the *giver*).
5. On the contrary, it is explicitly stated that the *giver* of the *Civil-Fruit* is the same as the *seller* of the *ExploitedGood*.
6. The *Assets* which must be given by the *seller* to the *buyer* are the *CivilFruits* produced by the asset which has been sold.
7. According to the Italian civil code, when a duty created by an obligation is violated by an agent, he must refund the damages created to the beneficiary: the sanction associated to the *Give-fruit* duty is thus to repay the buyer for the damage due to not giving the fruits of the sold assets.

6 Ontological Models of the Legal System

Classical formalizations of legal reasoning are based on deontic logic, as [1,21,27,28], to quote just a few examples. More recently, ontologies have been adopted as a means to shape the legal domain, beyond the basic deontic primitives. Ontologies have been used in a wide range of applications, from legal advice (see the application of the CLIME ontology to Maritime Law [6,30], the representation of cadastral data and norms ruling the Real Property Transactions [23] and to the access to legal information ([24,31]). Various studies aimed at proposing ontological primitives [20] or at comparing and evaluating different

approaches to legal ontologies [3,26]. In this section, we overview three models, which seem more relevant for setting the context of the present work.

In various papers, Breuker, Valente and Winkels (BVW) have described a ‘functional model’ of legal systems [7,25].

Their perspective is much wider than ours, but BVW’s view of model-based reasoning is relevant in this context. Their approach moves away from pure heuristic reasoning towards a full representation of the principles and contents of legal knowledge. However, they claim that full model-based reasoning is not adequate for the task at hand, so that “weaker versions of model-based reasoning that do not require full envisioning” [25], p.1082 are preferable. It cannot be denied that full-blown model based reasoning is hardly feasible in a domain as complex as legal reasoning. However, it seems that some further steps towards this end can be useful to meet the goal of linking legal concepts to world knowledge.

Our view is that many of the concepts which are related to the notion of agency (i.e. behavior, intention, knowledge/belief) are relevant in legal modelling, but they still lack an adequate formalization in terms of ontological primitives. We claim that BDI models, together with their involvement of desires and intentions, are one of the essential bricks required to expand and extend BVW’s analysis. In fact, in assessing a case, it is not only necessary to decide if one or more norms have been broken, but also to understand why an agent did break them. And this cannot be done, unless one has a view of the reasoning mechanism that led the agent to choose that specific line of behavior (see also the description of *Agent causation* in [18]). The present article tries to specify which is the link between an agent’s intentions, his behavior and the norms that affect them. In this sense, it can be seen as an extension of BVW’s model, although our focus is more on the reasoning of the agent than on the reasoning of the legal system.

Similar comments apply to the system described in [17], where the “conceptual frame-based ontology” includes three types of frames: norm frames, act frames, and concept-description frames. The norm frames include five slots, which describe the subject of the norm, the legal modality of the norm (duty-imposing, permission or power-conferring), the action to which the norm refers to (What must be done or forborne?), and some extra conditions of application (place and time). As we have seen, we assume that a sixth slot is required, i.e. the sanction. In our view, this is essential in the task of explaining how the existence of a norm affects the behavior of agents. Actually, the act frame includes three slots that are related to agent behaviour: *cause*, *aim*, and *intentionality*, but it is not clear if they have any impact on the actual model. In any case, the glosses reveal that these terms are used in a rather different way than we do (see Section 4).

A third model which is relevant here is that presented in [12]. It is based on three conceptual primitives, i.e. *states of affairs*, *events* and *rules*. States of

affairs concern any type of piece of reality (as ‘John is a thief’, or ‘A minor cannot make a valid will’), and are changed by events (as ‘John taking away the car of Gerald’ or ‘An international treaty being ratified’). There are subcategories of events:

“A special kind of events are acts: events that consist of the intentional behaviour of an individual. A special category of acts are the so-called juristic acts” [12], p.1049.

In our view, one of the most important features of Hage & Verheij proposal is the parallel existing between the pair <event,causality> and the pair <rule,constitution>. The events change the state of affair ‘obtaining’ (i.e holding) before the event into a new state of affair obtaining after the event. And this new state of affairs is causally related (via its ‘effects’) to the event. On the contrary, two state of affairs (that occur simultaneously) are related via a constitution relation (called supervenience) if there is a rule establishing the existence of this relation. For instance, the event ‘signing of a contract’ is causally related to the state of affair ‘the contract is signed’, and ‘the two contractors are under a contractual bond’ supervenes to the latter. In case of supervenience, there are conventional conditions for the existence of the relation: it is not different to have the contract signed and to have two individuals under a contractual bond, provided that there is a rule stating the correspondence; so, it is mainly a problem of description of a state of affairs which actually is a single one.

According to the previous discussion, we claim that actions, the way people use their knowledge about actions, and the way people decide which goal(s) to pursue via their actions, have a basic role in defining a legal ontology.

7 Conclusions

In this article, we have presented an ontological model of norms, based on the behaviour of agents. We have shown that norms can be characterized as *constraints on behaviour*, i.e. as statements specifying what an agent can and cannot do, and what happens when a norm is broken. The basic idea is that agents choose a line of behaviour according to the utility they may gain; and usually the breach of a norm produces a decrease in the estimated utility, because of the risk of being sanctioned. In order to include in the ontology knowledge about behaviour, we have provided a sketch of an ontological representation of plans, showing how a *Norm* can affect the planning process: the presence of a *Norm* can urge an agent to adopt a given line of behaviour (complying with the norm) instead of another (breaching the norm). This is obtained by introducing the notion of utility and by letting the agent determine his intention according to the expected utility.

Although the article has mainly addressed primary norms, it has also shown that the proposed model covers *authorities* in a legal system, and the way they are created. Finally, we have shown how the model applies to a specific case study (*Goods* and *Fruits*).

Two final comments concern the degree of coverage of the article with respect to the various components of a legal system and the complexity of the representation. As we have stated in the introduction, the goal of this paper is not to develop a general model of a legal system (see the models described in Section 6), but only to give an ontological characterization of a specific aspect, i.e. the role of primary norms. In principle, norms are just a small portion, although crucial, of such a model (see Section 2). Representing norms in an ontologically plausible way is the first step towards the implementation of a general model; this can be grounded on the behaviour of agents; agents are the entities which populate the societies that are regulated by legal systems. We believe that adopting them as the foundation for the representation is, in our view, the main contribution of this work. Of course, other agents do exist, most noticeably the judges; also judges (as all agents) are subject to norms, but they also have the role of assessing cases; this is a particular activity, that is not addressed in this paper, but that can be arguably assimilated to a kind of diagnostic reasoning: given some evidence (symptoms), classify the situation according to the categories appearing in the system. Since, in doing that, the court must respect some norms, it seems reasonable to assume that the model applies to it equally well, provided that a suitable representation is associated with the process of assessing the case.

Finally, the complexity of the representation. We have argued in favor of a language including some constructs that makes the language computationally hard. Although this is not the focus of the paper, we must stress that this appears to be unavoidable, unless one is able to show that the same concepts can be represented with simpler constructs, or that the knowledge expressed by these concepts can be left out of the ontology without loss of information. We believe that neither is the case, so that we hope that suitable heuristics can help a reasoner to obtain results within acceptable time limits.

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