

A Legal Ontology of Relationships for Civil Law System

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Abstract. The civil law system is highly characterized by relationships. The general rule is that any document of this domain is always embedded in a context of the legal order. The legal order can be defined as a set of norms; thus, understanding concepts of a legal norm is important to understanding other legal norms. However, this feature impairs knowledge of the law, since a thorough understanding of a norm requires a specific knowledge for understanding the dependence between legal norms. Considering the difficulty in undeciphering this knowledge, this paper highlights the importance of modeling relationships between legal norms in a civil law system. In the present paper, we propose an ontology aiming to capture a clear, concise and unambiguous view of this domain, as well as systematize and reveal the dependence between legal norms with an emphasis on relationships existing in civil law. With such an ontology, we expect to provide a shared understanding of the concepts and relationships, enabling interoperability. Due to the complexity of the domain, we developed a reference ontology written in OntoUML. In the paper, we underline the major aspects of our ontology and emphasize its potential application as a semantic reference for various civil law systems in the world.

Keywords: Conceptual modeling, Legal ontologies, OntoUML

1 Introduction

The contemporary legal systems of the world are generally based on one of three basic systems: civil law, common law, and religious law or combinations of these. Civil law is the most widespread system of law around the world.

A central quest in the civil law system is the understanding of relations between norms. The civil law system is highly characterized by relationships. The general rule is that any document of this domain is always embedded in a context of the legal order. The legal order can be defined as a set of norms. Thus, understanding concepts of a legal norm is important to understanding other legal norms.

However, this feature impairs knowledge of the law, since a thorough understanding of a norm requires a set of skills for understanding the dependence between legal norms.

On the other hand, legal norm documents are semistructured and hierarchically structured in nature. This includes the systematic organization of a legal document. In this context, the structure consists of normative parts rather than simply documents. So taking into account the structure of legal knowledge could facilitate the understanding of legal concepts, enabling interoperability [13] [8].

According to [6] we will experience an increasing demand for building reference ontologies in subject domains in reality, as well as employing them to address classes of problems, for which sophisticated ontological distinctions [3] are required. According to [2], Legal domain is one of these classes of problems.

In this paper we present a legal ontology of relationships for a civil law system written in OntoUML in order to improve access to normative elements and components rather than simply documents. The position advocated in this work is that allowing free access to law is required for the understanding of the law. Thus, it is possible to pose queries on normative acts.

The paper is organized as follows: In Sections 2 and 3 we present the background underlying our proposed ontology. In Section 4 we present the related works. In Section 5 we describe our legal ontology with its concepts in which we outline its importance. In Section 6 we present an illustration of our ontology by a running example. Finally, in Section 7 we conclude the paper and provide an outlook for the continuation of this research.

2 Ontological Unified Modeling Language (OntoUML)

Ontological Unified Modeling Language (OntoUML) is a conceptual modeling language whose metamodel has been designed to comply with the ontological distinctions and axiomatic theories put forth by a theoretically well-grounded Foundational Ontology called Unified Foundation Ontology (UFO) [4][5].

Due to space limitations, we concentrate here on a fragment of the OntoUML, with a specific focus on distinctions spawned by variations in meta-properties of a modal nature. The main UFO categories are depicted in Figure 1. We restricted ourselves to OntoUML elements enumerated from 1 to 9 (see aforementioned [4] for details), namely, those categories of Object Types that extend the ontological notion of Substance Universal, Moment and Relation. According to [4], this fragment comprises the ontological notions that are believed to be most recurrent in the practice of conceptual modeling for information systems. Since OntoUML is a modeling language whose metamodel is designed to be isomorphic to the UFO ontology, the leaf ontological distinctions in Figure 1 appear as modeling primitives in the language.

The UFO meta-properties are [4]: Identity (I+), Rigid (R+), Anti-Rigid (R-), Semi-Rigid (R). The object types are divided in two classes: Sortal and Non-Sortal. We can only make identity and identification statements with the support of a Sortal, i.e., the identity of an individual can only be traced in

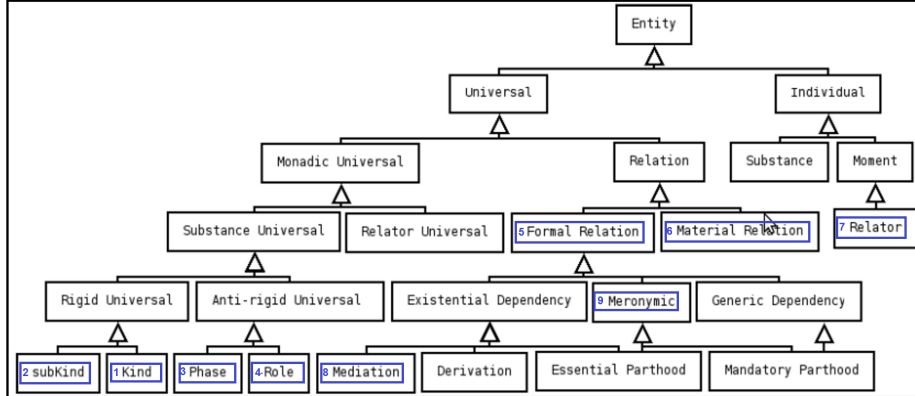


Fig. 1. Excerpt of UFO taxonomy [4]. The blue lines delimits elements used in this work.

connection with a Sortal type, which provides a principle of individuation and identity for the particulars it collects. Since Non-Sortal cannot supply a principle of identity for its instances, we assume that, all Non-Sortal Types in the model must be represented as abstract classes.

The type in the root of a chain of specializations among rigid types is termed a **Kind (1)** (e.g., Person) and the remaining rigid types in this chain are named **Subkinds (2)** (e.g., Man, Woman). The type Kind being the unique top-most rigid sortal instantiated by an individual and define a stable backbone. These two subcategories are called rigid Universal types [4].

Related to anti-rigid Universal types, there are two sub categories: **Phases (3)** and **Roles (4)**. In both cases, we have cases of dynamic classification, i.e., the instances can move in and out of the extension of these types without any effect on their identity. However, while in the case of Phase these changes occur due to a change in the intrinsic properties of these instances; in the cases of Role, they occur due to a change in their relational properties [4].

Relations are entities that glue together other entities. In OntoUML, two broad categories of relations are typically considered, namely, material and formal relations [7]. **Formal relations (5)** hold between two or more entities directly, without any further intervening individual. Examples include relations such as **meronymic (9)**, subset-of, instantiation, among others not discussed here. **Material relations (6)**, conversely, have material structure on their own and include examples such as kisses, conversations, fights and commitments. The relata of a material relation are mediated by **relators (7)**. For example, an individual purchase is a relator that connects a customer and a supplier, and a treatment is a relator which connects a patient with a medical unit. The relation that connects this elements is called **mediation (8)**. Mediation is a specific type of existential dependency relation.

3 Civil law

There are hundreds of legal systems in the world. At the global level, international law is of great importance, whether created by the practice of sovereign states or by agreement among them in the form of treaties and other agreements. Some transnational entities such as the European Union have created their own legal structures.

Although each system has its own individuality, it is possible to group many of them into legal “families”. Generally based on one of three basic systems: civil law, common law, and religious law or combinations of these.

Civil law is the most widespread system of law around the world. The central source of law that is recognized as authoritative are codifications in a constitution or statute passed by a legislature, to amend a code. It is also sometimes known as Continental European law.

In contrast to the Common Law system, civil law is characterized by the predominance of normative acts. The jurist and legal philosopher Hans Kelsen created a theory based on a civil law system called the Pure Theory of Law [10] and the concept known as “the grand norm” and Kelsen’s pyramid [11]. He used this term to denote the basic norm, order, or rule that forms the underlying basis for a legal system. This is a theoretical concept based on a need to determine a point of origin on which the system can be legitimized. The constitution has, as a form, a complex of norms, such as content, human conduct, motivated social relations, and close to the achievement of the values; that point to the existing power that emanates from the people, cannot be understood and interpreted, not having in mind that structure, considered sense of connection, how is everything that which integrates a set of values. The constitutional norm is higher than the common law because the common law (or infra-constitutional norms, i.e., are down and out of those that are below the constitution) and are valid derive from the constitution. The preeminence of the constitution of a country stems from the fact that it is the product of the original constituent power, while ordinary laws are the produce of an institutional power. Thus, the constitution is considered sovereign.

Conceptually, its structure is represented by a pyramid with the top-most part being the basic norm and all other norms derived from this in an ordered and logical structure descending to the base of the pyramid. It is understood that law must also have a normative basis, or a remission. Logically, there must be a basic norm on which law rests. Any norm not within this structure is seen as an illegitimate norm to the structure. There has to be such a norm or justification would never reach an end. This yields a more subtle and defensible version of positive law and the basic norm the logical constitution. It is the basic evaluative premise from which the legitimacy or validity of all the laws derive. Laws can be created, but the basic norm specifies how they can be created and changed. Only those created in accordance with the basic norm will be valid laws. In other words, it is the prescriptive premise from which the obligation of law follows. Without this basic norm, we cannot achieve the legal ought. Figure 2 shows de logical constitution and the relationships.

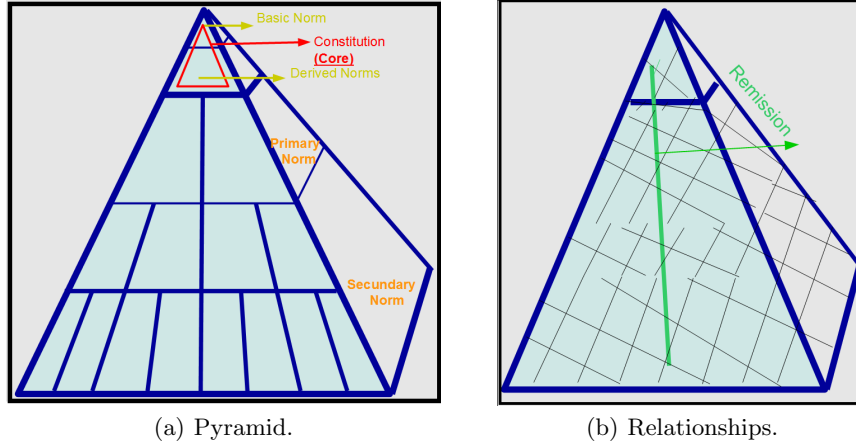


Fig. 2. The logical constitution.

4 Related Works

In the past, initial legal ontology development efforts in Europe were influenced by hopes and trends in research on legal expert systems based on syllogistic approaches to legal interpretation [1]. The first monograph on legal ontologies [14] was published as early as 1995. The literature suggests that legal ontologies may be distinguished by the levels of abstraction of the ideas they represent [2], with the key distinction being between core and domain levels. The core level ontology is a model of general concepts that are believed to be central to the understanding of law and may be used in all legal domains [14].

Currently, most legal ontologies being developed are domain-specific ontologies [2]. More recent contributions in ontologies include [9] (1) the LKIF-Core Ontology, (2) the LRI-Core Ontology, (3) the DOLCE+CLO (Core Legal Ontology), and (4) the Ontology of Fundamental Legal Concepts.

Although these approaches focus on (i) legal common law ontologies and (ii) domain-specific ontologies, we are primarily concerned with the civil law systems. In this sense, we created a legal ontology of Relationships for the civil law system written in OntoUML aiming to capture a clear, concise and unambiguous view of the domain. By doing so, we systematized and unfolded the dependence between legal norms with an emphasis on relationships existing in civil law, consequently, allowing a shared understanding of the concepts and relationships, enabling interoperability.

5 Legal ontology of Relationships for a Civil Law System

This section presents our ontology, which offers a legal ontology of relationships for a civil law system. The ontology covers the concepts by connecting multi-

ple albeit complementary levels of granularity. It is represented in OntoUML, comprising concepts, relations and cardinality constraints.

The definition of the present legal ontology was based on a detailed examination of the civil law theories especially the Core Theory of Law [10]. The main goal of the ontology, which is inherent to a reference ontology, is: (i) addressing data/standard integration between legal Portals in order to support the processing of complex queries in heterogeneous information sources; (ii) conveying a legal knowledge base; (iii) providing a domain theory striving for independence of codification languages as much as specific applications and also (iv) supporting reasoning knowledge-based systems.

We build an ontology of relationships to represent the relationships for civil law system [12]. The definition of the legal ontology was based on a detailed examination of the civil law theories especially Core Theory of Law [10]. We consider this theory as representative of the minimal core that should be supported via dedicated ontologies. The concepts and relationships are described in the sequence. Figures 3, 4, 5 and 6 show the OntoUML diagram.

- **Written Norm**: a precept required or recognized as such by the state. Objective social formula will be imperatively expressed all by the State.
- **Norm**: a rule, article of law or legal prescription.
- **Effectiveness**: it is the production of legal effect of a law or administrative act. **Effective** act is one that produces effects. **Noneffective** is the event in which a legal norm, or part of, loses effectiveness.
- **Validity**: It is related to the existence of a norm in the legal system in one or more time periods. A **lawful** norm prevails until it is revoked or until the expiration of the period provided therein. It is between the existence that it is formalized by enactment, and effectiveness, which arises from the social norm of compliance. **Unlawful** is the event for which a legal norm, or part of, loses validity.

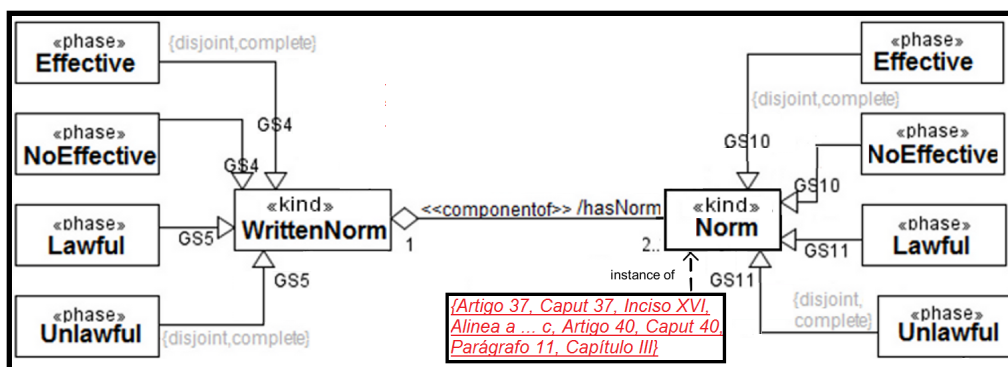


Fig. 3. Legal Ontology of Relationships for Civil Law System (Part 1). The red words show the instances.

- **Constitutional Norm:** is a superior norm above all other norms and therefore the rules contravening with the Constitution shall be deemed unconstitutional. **Basic Norms:** norms resulting from the initial process of the constitution. **Derived Norms:** norms derived from constitutional norm amendments. We emphasize that some of the clause amendments will not change the constitution, so reading the text of the amendment is required.
- **Infra-Constitutional Norm:** is an inferior norm that seeks to raise its ground of validity in superior norms and so on, up to the Constitution level.
- **Primary Norm:** They are the primary norms such as laws or normative acts.
- **Secondary Norm:** They are secondary or administrative norms. They aim to regulate or implement what is provided in primary norms. They are assessed, developed and approved by a Legislative chamber. We emphasize that this type of norm cannot change the Legal system, creating rights and obligations.
- **Constitution:** system of legal rules, which regulates the form of the state, the form of their government, the mode of acquisition and execution of power, the establishment of its bodies, the limits of its action, the fundamental rights and guarantees of man [10]. In other words, it is the set of norms that organizes the elements of the state.

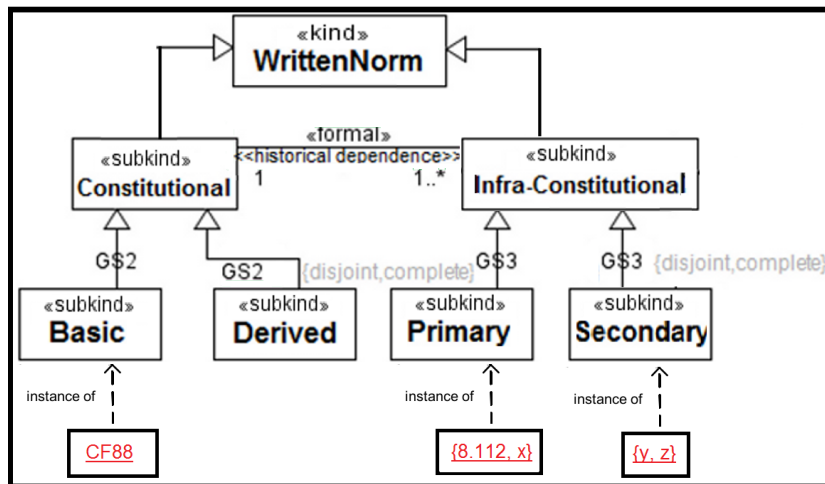


Fig. 4. Legal Ontology of Relationships for Civil Law System (Part 2).

- **Remission:** association that occurs between norms (**Remised** and **Remise**) for forward to a part of a normative text point with/without relationships between subjects.
- **Remised:** norm that wards refers to a certain **Remise** norm.
- **Remise:** final norm sent by **Remised** norm.

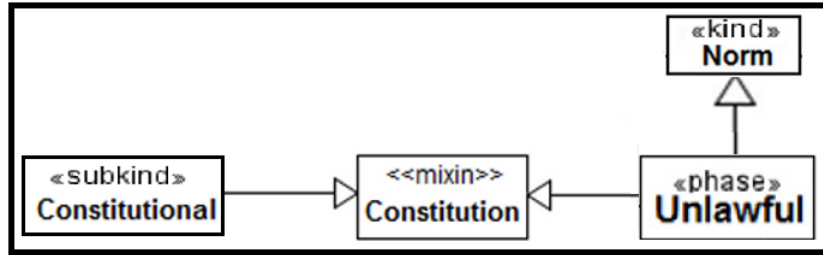


Fig. 5. Legal Ontology of Relationships for Civil Law System (Part 3).

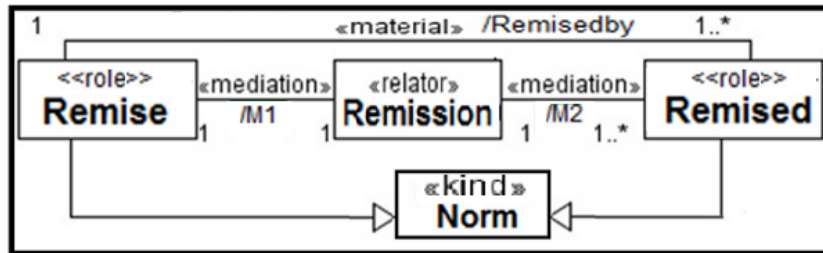


Fig. 6. Legal Ontology of Relationships for Civil Law System (Final).

6 Running Example

Without claiming to be the best solution, our ontology was achieved in practice. Brazil is a country of continental proportions, composed of 27 states and more than five thousand municipalities, or cities, as no distinction is made between town and city in Brazil. As a federal system, we have three levels of government (federal, state, and city), with each state and municipality having its own legislative chamber. While states and cities follow a unicameral system, the federal level has a bicameral system, with the National Congress divided into a Chamber of Deputies and the Federal Senate. These legislatures generate numerous laws, or normative acts. So the abundance of normative acts is very significant.

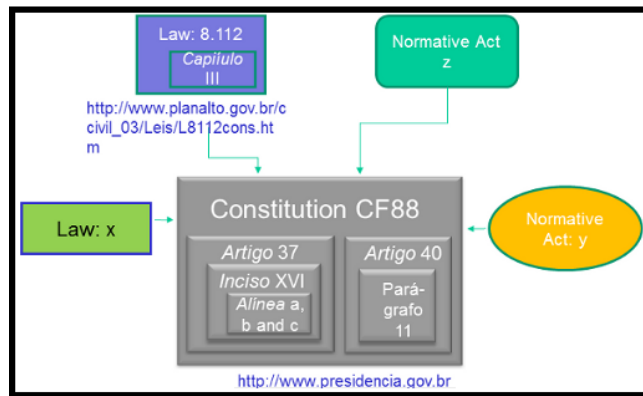
To illustrate an example, as much as serving as an evaluation resource, we posed the following **Competence Question (CQ)**. This question involves a scenario in which one person would like to know about a particular public contest. The person may know nothing about laws or normative acts involved in this scenario. The question is described below:

CQ1: Can I apply for numerous government jobs?

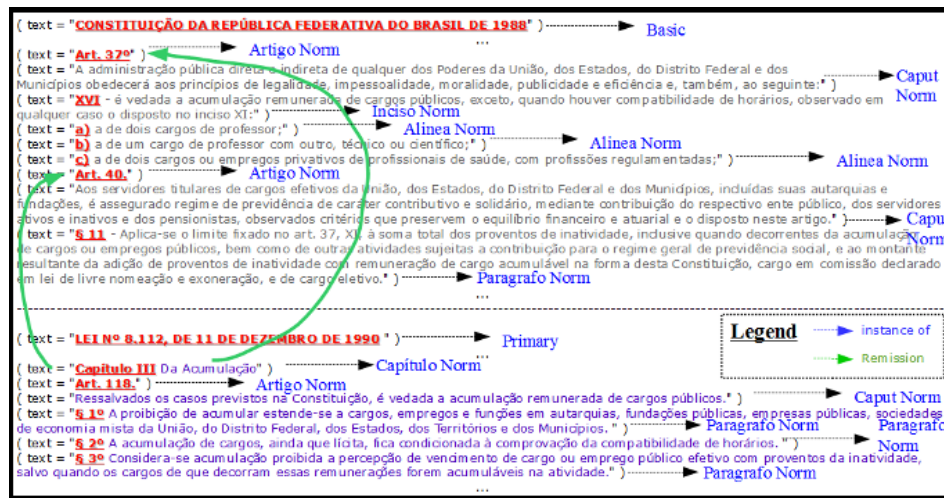
As mentioned before, we would have to search laws at the three levels (federal, state and city). The starting point would be the Constitution of Brazil. Our question is about one of the Constitution's subjects.

Based only on the official document of the Constitution, it is not possible to answer this question because this content is not covered solely by the constitution. Moreover, we do not know the relations between the constitution and other

normative acts. And the language expressed (HTML) does not take into account this expressivity. Related for other instances, the situation is the same. The answer for this question is in two legal documents. The applying for government jobs is a strict subject of federal law. So the normative acts are written by Federal instance. Figures 7 (a) and (b) show legal documents involved and norms, respectively. The two normative acts are: 1) **The Constitution of Brazil: Artigo 37, Inciso XVI and Alíneas and Artigo 40, Parágrafo 11**; 2) **8.112 Law: Capítulo III**. The blue words show the class's name. The red words show the instances



(a) Legal documents (written norms) involved.



(b) Legal norms.

Fig. 7. Running example.

7 Conclusions and Perspectives

This paper described a legal ontology of relationships for the civil law system taking into account the dependence between legal norms with emphasis on relationships existing in civil law. By dealing with reference ontology, our approach deals with the challenge of legal information modeling, capturing a clear, concise and unambiguous view of the domain, as well as systematizing and revealing the dependence between legal norms, consequently, allowing a shared understanding of the concepts and relationships, enabling interoperability.

Two important modeling choices should be emphasized. The first one concerns the language OntoUML. One of the OntoUML model lies in the more intuitive understanding of the domain, which allows a quicker and improved visualization of concepts and relations. The second modeling choice concerns the representation model. By using a representation model such as OntoUML, knowledge can be identified, acquired and analyzed, and then formalized. It was important for help modelers to externalize knowledge about the domain. The notion of relator played an important role to help modelers to externalize their tacit knowledge about the domain. By doing this, we presented how much of important domain knowledge remained tacit in the minds of the modeler and, consequently, renders the ontology a valuable add-on.

The ontology can offer a viable means of retrieving legal knowledge, instead of an enormous and confusing amount of documents and information as current applications do. However, OntoUML is not a codification language. So, a number of different implementations and applications can be produced in order to supporting reasoning knowledge-based systems. Due to space limitations, we concentrate here on OntoUML models. More details about our implementation can be found in [12].

The challenges faced by legal ontology engineering are great, and the limitations of legal ontologies are substantial. Nevertheless, the potential of legal ontologies is immense. Law-related professionals and legal experts have a central role to play in the successful development of legal ontologies and legal semantic applications. In this paper, we underline the major aspects of our ontology and emphasize its potential application as a semantic reference for various civil law systems in the world.

Several research questions about legal information retrieval are remain unanswered, and will be tackled in future works. In particular, in addition to considering more relations in legal documents, we will explore other relationships based on legal doctrine. We plan to devise a method to facilitate the approach application on a large scale.

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