

Ontological Model of Legal Norms for Creating and Using Legislation

Stevan Gostojić, Branko Milosavljević, and Zora Konjović

Faculty of Technical Sciences, University of Novi Sad
Trg D. Obradovića 6, 21000 Novi Sad, Serbia
{gostojic, mbranko, ftn_zora}@uns.ac.rs

Abstract. This paper presents a formal model of legal norms modeled in OWL. It is intended for semiautomatic drafting and semantic retrieval and browsing of legislation. Most existing solutions model legal norms using formal logic, rules or ontologies. Nevertheless, they were not intended as a basis for drafting, retrieval and browsing of legislation. The proposed model formally defines legal norms using their elements and elements of legal relations they regulate. The duality between the content and the form of legislation is exploited by connecting it to the XML model of legislation based on the CEN MetaLex specification. Those models are verified by applying them to the norms contained in an existing piece of legislation and by developing a prototype application for semantic browsing of legislation that is based on the models.

Keywords: legal norms, legislation, ontology, OWL, XML, CEN MetaLex, browsing

1. Introduction

The quality of legislation and legislative drafting procedures is questionable. Drafting of legislation starting from its semantics (cf. [1]), with the semi automation of the application of legislative drafting guidelines, can improve the quality of legislation (its consistency, intelligibility and usability) and drafting procedure (its efficiency and effectiveness).

In order to make decisions, lawyers use legislation corpus as a knowledge base of legal norms and their relations, since legal norms are applied as they are formulated in legislation. Traditional legislation retrieval and browsing systems are based on text retrieval and browsing. Those systems do not solve the problem of legal rule fragmentation (the property of the legal system that legal norms which regulate one social relation or elements of one legal norm are contained in different legislation or different elements of a piece of legislation). This property is one of the main reasons for ineffective and inefficient usage of legislation, especially by citizens who are not lawyers. The semantic retrieval and browsing of legislation, based on the meaning of the legal norms it contains, is a promising solution to this problem.

This paper proposes a formal model of legal norms used as a basis for the development of expert systems for semiautomatic drafting and semantic retrieval and browsing of legislation. It is connected with the formal model of legislation based on the CEN MetaLex specification as described in [2]. The model was specified in Web Ontology Language (OWL).

The rest of this article is structured as follows. Section 2 reviews related work. Section 3 defines basic legal concepts and describes the proposed formal model of legal norms that is based on those concepts. Section 4 gives an example of the usage of the proposed model as applied to norms contained in a specific legislation [3] and describes a prototype application used for semantic browsing of legislation. Finally, the last section gives concluding remarks and proposes directions of future research.

2. Related Work

Most commonly used formalisms for the representation of legal norms are formal logic, rules and ontologies. Some logical formalisms for their representation are described in [4], [5] and [6].

Biagioli and Grossi in [4] present a logic-based approach to legislative meta-drafting. They introduce classes of meta-data, corresponding to the specific classes of legal provisions. The provisions in the model are divided into two main families: rules (constitutive and regulative provisions) and rules on rules (modificatory provisions). The constitutive provisions lay out the components of the relevant pieces of legislation by introducing new types of entities, defining new terms or procedures, creating new institutional bodies, and attributing powers. The regulative provisions concern deontic concepts. The modificatory provisions manage the dynamics of laws. They are divided into modifications and derogations.

This formal model expressed in DL had large influence on the design of our ontology. Nevertheless, we have come to different results by introducing legal relation in our model and paying special attention to the structure of the legal system, the legal norm and the legal relation.

Sartor in [5] gives a formal reconstruction of some fundamental patterns of legal reasoning. Legal norms are represented as unidirectional inference rules that can be combined into arguments. The value of each argument (its qualification as justified, defensible, or defeated) is determined by the importance of the rules it contains. Applicability arguments, intended to contest or support the applicability of legal norms, preference arguments, purporting to establish preference relations among norms, and interpretative arguments are also formalized.

Gordon in [6] presents Legal Knowledge Interchange Format (LKIF). LKIF is an XML schema for representing theories and proofs constructed from theories. A theory in LKIF consists of a set of axioms and inference rules.

Some ontologies that model legal norms are Conceptual frame-based ontology of Law [7], FOLaw [8], LRI-Core [8], DOLCE+CLO [9], OWL Ontology of Fundamental Legal Concepts [10] and LKIF-Core [11].

Conceptual frame-based ontology of Law is constituted by three frame structures. These structures are the norm frame, the act frame and the concept-description frame. A legal-theoretical analysis has determined the form of the structures. Every norm must comprise a norm subject, a legal modality and an act description. Identified types of norms are norms of conduct, norms of competence, duty imposing, permissive, general, individual, categorical and hypothetical norms. Depending on the type of a norm (categorical or hypothetical), these elements can be supplemented with conditions of application. The aspects of the act are an agent, an act type, a modality (modality of means and manner), a setting (temporal, spatial and circumstantial aspect), a rationale (a cause, an aim and an intentionality) and a final state. The aspects of the concept description are the concept to be defined, conditions under which a concept is applicable, instances of a concept, a concept type and application provisions. Some additional elements of all three frames are the identifier (used as a point of reference for a frame), the promulgation (links a frame to its source) and the scope (limits the application range of a frame).

The focus of the Conceptual frame-based ontology of Law was on conceptual primitives used to model the legal domain, not on the formal version of the ontology nor on the development of expert systems. Therefore, the result of this research could not be directly applied to the drafting, retrieving and browsing of legislation.

FOLaw and LRI-Core ontologies were developed at the Leibniz Center for Law. FOLaw specifies functional dependencies between types of knowledge involved in legal reasoning. It distinguishes six types of knowledge. Normative knowledge is the most typical category of legal knowledge, norms express (un)desirable behavior using deontic operators permission, obligation and prohibition. Meta-legal knowledge is knowledge needed to resolve conflicts between individually applicable norms. World knowledge contains description of the behavior in the world of discourse. Responsibility knowledge establishes a relation between the violation of a norm and an agent who is responsible for its violation. Reactive knowledge specifies which reaction should be taken when the norm is violated. Creative knowledge allows the creation of social institutions and legal persons. The authors have developed a new representation and inference formalisms for the normative knowledge that are an alternative to deontic logic [12].

FOLaw is a functional ontology. It presents a legal-sociological view rather than a perspective from the law itself since it is based on the roles that the legal system plays in a society. Structural ontology of law is better suited for drafting, retrieval and browsing of legislation.

LRI-Core is written in OWL. One may distinguish many concepts in law, but not many are typical for law. These concepts are usually specializations of common sense concepts. Therefore, LRI-Core contains two levels. The more abstract level is a foundational ontology that covers concepts from physical, mental, and abstract worlds and roles. The more concrete level is a legal core

ontology. The legal core ontology is used for development of domain ontologies.

Its major objective is to provide support for developing legal domain ontologies by clarifying common conceptual denominators in the legal domain (e.g. role, norm, responsibility, etc). As such, it is too abstract with respect to the goals set out during the development of the ontology described in this paper.

Core Legal Ontology (CLO) is a result of collaboration between ISTC-CNR and ITTIG-CNR. It organizes legal concepts and relations about the physical, cognitive, social, or properly legal worlds based on formal properties defined in DOLCE. In CLO, a legal norm is a subclass of the social norm, which is expressed by a normative text, and is realized by a document. It distinguishes constitutive and regulative norms. Constitutive norms introduce new entities in the ground ontology, while regulative norms provide constraints on existing ground entities. Definitions and power-conferring rules are subclasses of constitutive norms. Regulative norms define behavior courses, and have at least one modal description as a proper part.

Although it is useful for the definition of legal domain ontologies, it is our opinion that CLO is rather heavyweight for the problem we are planning to solve and does not describe the structure of the legal system with the needed level of detail.

The OWL Ontology of Fundamental Legal Concepts has been developed under the ESTRELLA [13] project with the aim of clarifying the basic theoretical constituents of legal concepts and of contributing to enable semantic access to digital legal information. The formal language chosen to express the first version of this ontology is OWL. The first classification of legal concepts includes two main classes: norms and normative judgments. Norms state normative judgments. Norms can be unconditional, that is their judgment may not depend upon any antecedent condition. Conditional norms are distinguished into rules that make a normative judgment dependent upon sufficient conditions. Initiation rules state that a certain normative proposition starts to hold when the rule's conditions are satisfied. Termination rules state that a normative proposition ceases to hold when the rule's conditions are satisfied. Supervenience rules state that a normative proposition holds as long as the conditions are satisfied. Factor-links make a normative judgment dependent upon contributory conditions (the condition favors the judgment, but it does not determine it). A normative judgment is the proposition expressing or stating a normative fact.

The LKIF-Core ontology consists of several modules, each representing a relatively independent cluster of concepts: expression, norm, process, action, role, place, time and mereology. The concepts in these modules were formalized using OWL. It is divided into three layers: the top level, the intentional level and the legal level. The top-level clusters of the ontology provide definitions of the context in which any legally relevant fact, event or situation occurs. Modules at the intentional level include concepts and relations necessary for description of mental state and behavior of agents. At the legal level, the LKIF-Core ontology introduces a comprehensive set of legal agents and

actions, rights and powers, typical legal roles, and concept definitions that allow the expression of normative statements.

Although the most comprehensive legal ontology so far, in our opinion LKIF-Core is not suitable for the solution of the posed problem for similar reasons as CLO.

Yet another formalism for the representation of legal norms is described in [14]. Olbrich and Simon in [14] discuss visualization and formal modeling of a legally regulated process. They explicitly derive a process structure that is implicitly specified within the paragraphs themselves. The Semantic Process Language (SPL) is used to translate paragraphs into process models, since it enables articulation of language structures into executable workflow models.

Not surprisingly, the main element of all reviewed ontologies is the (legal) norm. Some of those ontologies also identified key concepts such as (legal) subjects, (legal) actions, legislation, etc.

Nevertheless, none of the reviewed ontologies identifies legal relation as a key concept in the legal domain and they do not pay special attention to the structure of the legal system, the legal norm and legal relation.

3. Ontological Model of Legal Norms

The model of legal norms presented in this paper adopts the structural view of the legal system and defines other concepts starting from the elements of the legal relation and the legal norm. It is based on the related work on modeling legal norms reviewed in Section 2 and the interpretation of legal-theoretic views presented in [15], [16] and [17].

Bearing in mind computational properties, we decided to develop a light-weight ontology suited for a particular task instead of adopting existing general-purpose ontologies. Some of the specified concepts (e.g. subject, object, act, social norm, etc.) have very general meaning and can be imported from existing foundational ontologies. One candidate is DOLCE ontology [18] because it focuses on social entities (e.g. organizations, collectives, norms, etc.) and is minimal in comparison to other foundational ontologies. Other concepts (i.e. legal norm, legal act, right, duty, etc.) have more precise (legal) meaning and can be imported from existing legal ontologies. Some candidates are CLO and LRI-Core (especially CLO because it shares many concepts such as legal norm, legal fact, legal act, legal subject with our ontology). Nevertheless, this was not our primary concern in this paper.

As noted earlier, the purpose of this model is to provide for semiautomatic drafting and semantic retrieval and browsing of legislation by exploiting duality between the form of legislation (textual formulation of a system of legal norms) represented in XML using CEN MetaLex compliant model and the content of legislation (a system of legal norms contained in it) represented in RDF using the proposed model.

That means that the scope of the model are general and abstract legal norms, abstract social relations, abstract subjects, abstract objects and legis-

lation since the legal system is a system of general and abstract legal norms, while legislation formulates a part of the legal system. Abstract terms refer to ideas or concepts. Concrete terms refer to objects or events that can be sensed. General terms refer to groups. Specific terms refer to individuals.

We used top-down approach to ontology development to identify and formally specify concepts that are essential for the description of a legal system (a system of legal norms) paying attention to criteria such as clarity, coherency and extensibility [19].

Legal concepts were modeled as OWL classes while relations between those concepts were modeled as OWL properties. OWL was used as a modeling language because of its inference semantics, open world assumption and distributed nature. Inference semantics allows the use of existing tools (OWL reasoners and RDF data stores) as the basis for the development of expert systems. We have chosen to use OWL DL sublanguage because it offers maximum expressiveness without losing computational completeness and decidability. Open world assumption is a natural state of affairs in the legal domain. This model has to be distributed since different people (or organizations) will presumably model different parts of a legal system. Furthermore, the usage of open standards promotes technical interoperability with other information systems and the usage of existing tools.

The most important classes and properties of the model are described in this section (special attention is paid to the legal relation and the legal norm as central classes of the model). They are expressed either textually using N3 notation or graphically using figures created by the Protégé tool. When using N3 notation, namespace prefixes and nonessential properties are omitted due to space constraints. The full version of the ontology can be downloaded from [20].

A subject (*Subject*) is an observer (of an object). According to [15] and [16], it can be abstract (e.g. a natural person) or concrete (Alice). Since concrete subjects are out of the scope of our model, (the concept of) a subject was modeled as an OWL class, while a natural person (an abstract subject) was modeled as an OWL instance. On another level of abstraction, (the concept of) a natural person could be modeled as an OWL class, while Alice could be modeled as an OWL instance. In that case, the natural person could be a class and an instance at the same time, although that would compromise computational completeness and decidability of the model.

One abstract subject can be a specialization or a generalization of another abstract subject (e.g. a natural person is a specialization of a person). Those relations were modeled with *specializes* and *generalizes* properties. It should be noted that built-in *rdfs:subClassOf* property could not be used because it applies to classes only.

A legal subject (*LegalSubject*) is a subject that is a part of a legal relation. In other words, it is the holder of legal capacity.

An object (*Object*) is a thing being observed (by a subject). Objects can also be abstract (a telephone number) or concrete (the +381214852426 telephone number). One abstract object can be a specialization or a generaliza-

tion of another abstract object (e.g. a telephone number is a specialization of the personal data).

A legal object (*LegalObject*) is an object that connects legal subjects into legal relations or, in other words, an asset that is allocated between legal subjects. That asset can be a physical object (e.g. land, human body, data carrier, etc.) or a mental object (e.g. intellectual property, honor, data, etc.).

A social relation (*SocialRelation*) is a relation between two or more subjects. Abstract social relations are relations between abstract subjects (e.g. love between a man and a woman). Concrete social relations are relations between concrete subjects (e.g. love between Romeo and Juliet).

Since social relations are usually organized into hierarchies, one relation can be a specialization or a generalization of another relation (e.g. being a child is a specialization of being a descendant).

The legal relation (*LegalRelation*) is a social relation (*SocialRelation*) that is regulated by a legal norm (*LegalNorm*). This is a central class of the model. The legal relation is a starting point when modeling legal norms (that will be transformed into legislation). It is also used for retrieval of norms and legislation using criteria such as regulated social relations, addressed subjects and deontic modalities. To accommodate for that use case, legal relations have elements.

The elements of the legal relation (*RelationElement*) are a right (*Right*) and a duty (*Duty*). A right is the possibility of acting according to a particular disposition that is protected by the state. A duty is the necessity of acting according to a particular disposition that is sanctioned by the state. An obligation (*Obligation*) is a duty that orders particular action. A prohibition (*Prohibition*) is a duty that forbids particular action. A competence (*Competence*) is a right to act in the interest of another legal subject, so it is a right and a duty at the same time. The elements of legal relation are shown in Figure 1.

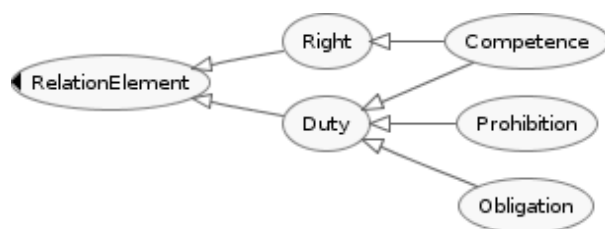


Fig. 1. The elements of a legal relation.

Legal relation elements connect legal subjects and legal objects into legal relations. A legal subject is connected with a legal relation element (its right or duty) with *has* property. Legal relation elements are connected with a legal object with *allocates* property. That way, a legal object connects the right of one subject and the duty of another subject into legal relation. Relations between legal relation, legal relation elements, subjects and object are shown in Figure 2.

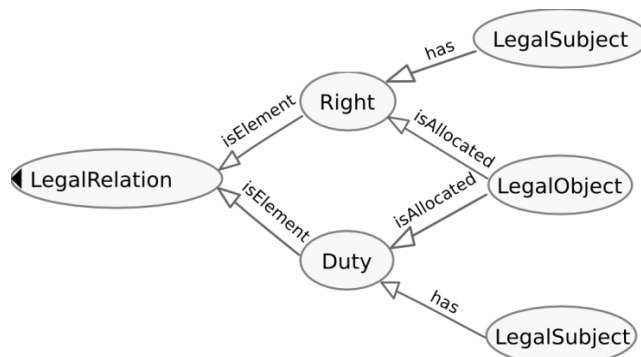


Fig. 2. The relation between legal relation and its elements.

A policy (*Policy*) determines the purpose of a legal norm, reasons why some social relations are acceptable to the society (or the state) while others are not. Usually, the purpose of the legal norm is to promote or preserve social values. Those values can also be promoted or preserved with other types of social norms. There are different types of policies: abstract policy (*AbstractPolicy*) or concrete policy (*ConcretePolicy*), basic policy (*BasicPolicy*) or special policy (*SpecialPolicy*), temporary policy (*TemporaryPolicy*) or permanent policy (*PermanentPolicy*), etc. Different classes of policies are implemented with different classes of legal norms. For example, temporary policies are usually implemented with norms that have a date of repeal. Policies are shown in Figure 3.

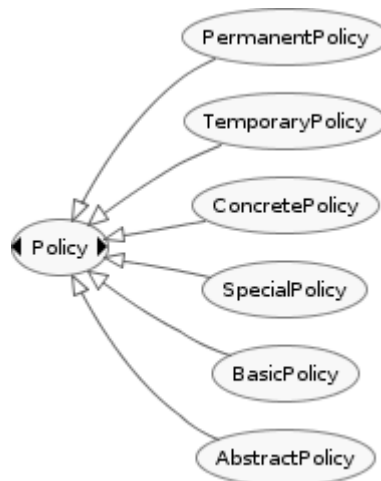


Fig. 3. The types of policies.

The policy is used for the interpretation of the meaning of legal norms that implement it. According to legislative drafting guidelines, each law is sup-

posed to explicitly state policies it implements, so judges and public officers could use textual formulations of policies to interpret and apply legal norms.

A social norm (*SocialNorm*) is a rule of conduct (or behavior) in a society. There are different kinds of social norms such as customs, moral and legal norms.

Social norms can be abstract or concrete and general or individual. Abstract norms are usually general and vice versa, but that is not always the case. A norm that pardons all prisoners for a concrete reason is a concrete and a general norm. A norm that elects a specific judge is an abstract and a specific norm.

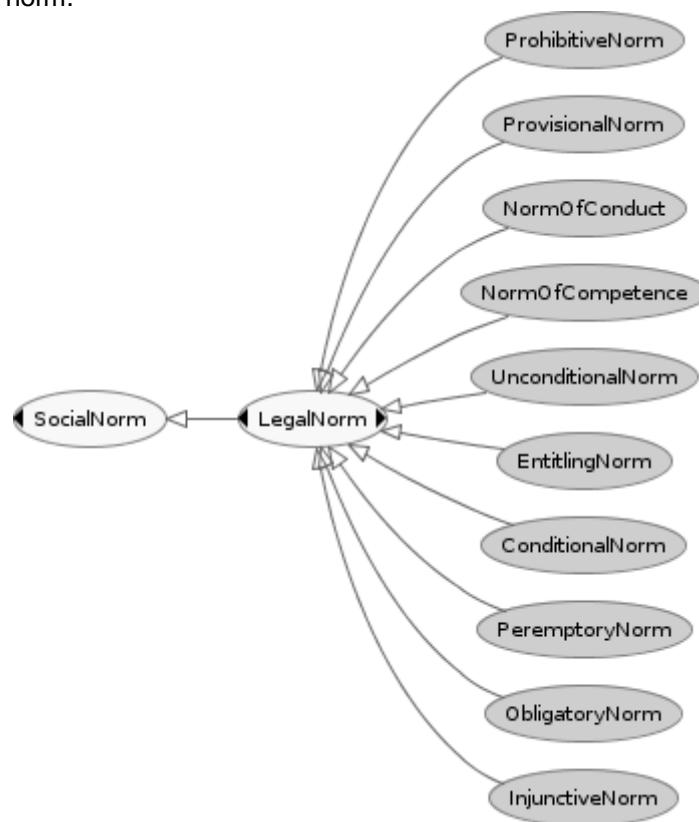


Fig. 4. The types of legal norms.

Although there are different views on what constitutes a legal norm (*LegalNorm*), for the purpose of this ontology it is defined as a social norm that is sanctioned by the state. It is a central class of the model. A legal norm is a rule of conduct in a society that contains a rule on the application of a sanction in the case of its violation. Legal norms describe and prescribe (dis)allowed legal relations. Since the state of the legal system is a set of legal states of legal subjects (the set of their rights and duties), they also describe

and prescribe (dis)allowed states of the legal system. The legal norm and its different types are shown in Figure 4.

Legal norms can be classified according to legal relations they regulate and elements they contain. Prohibitive norms (*ProhibitiveNorm*) regulate legal relations that contain prohibitions. Provisional norms (*ProvisionalNorm*) contain dispositive disposition. Norms of conduct (*NormOfConduct*) regulate legal relations that contain right or duty (or equivalently contain categorical, alternative or dispositive dispositions). Norms of competence (*NormOfCompetence*) regulate legal relations that contain competence (or equivalently contain discretionary disposition). Unconditional norms (*UnconditionalNorm*) do not contain disposition hypothesis. Entitling norms (*EntitlingNorm*) regulate legal relations that contain a right. Conditional norms (*ConditionalNorm*) contain disposition hypothesis. Peremptory norms (*PeremptoryNorm*) contain imperative disposition. Obligatory norms (*ObligatoryNorm*) regulate legal relations that contain obligations. Injunctive norms (*InjunctiveNorm*) regulate legal relations that contain a duty. Those classes of legal norms are not necessarily mutually exclusive. For example, the definition of norm of competence is shown in Listing 1.

```
NormOfCompetence
a owl:Class;
owl:equivalentClass [
  a owl:Class;
  owl:intersectionOf (
    LegalNorm [
      a owl:Restriction;
      owl:onProperty hasElement;
      owl:someValuesFrom DiscretionaryDisposition
    ]
  )
];
owl:equivalentClass [
  a owl:Class;
  owl:intersectionOf (
    LegalNorm [
      a owl:Restriction;
      owl:onProperty regulates;
      owl:someValuesFrom [
        a owl:Restriction;
        owl:onProperty hasElement;
        owl:someValuesFrom Competence
      ]
    ]
  )
].
```

Listing 1. The definition of the norm of competence.

Unlike some of the reviewed ontologies, our ontology does not specify the concept of constitutive norm, since that concept is not in the focus of the paper.

A legal norm is a basic building block of the legal system that is being modeled. It is used for modeling (a part of) a legal system that is going to be transformed into legislation that formulates it. It is also used for retrieval of legal norms and legislation using its properties. A legal norm has one or more

elements, regulates one or more legal relations, implements one or more policies, is a part of a legal institution, is contained in legislation, enters into force, is repealed and has efficacy on particular dates. Legal norm's properties are shown in Figure 5.

- effectiveOn (single date)
- enteredIntoForceOn (single date)
- formulates (single LegalAct)
- hasElement (multiple NormElement or RelationElement)
- implements (single Policy)
- isApplied (multiple Case)
- isCreated (single LegislativeCreation or LegislativeModification)
- isInterpreted (multiple ExpertOpinion)
- isRepealed (single LegislativeRepealment or LegislativeModification)
- repealedOn (single date)
- hasPart (multiple ClassificationElement)
- isPart (multiple ClassificationElement)
- regulates (single SocialRelation)

Fig. 5. The legal norm's properties.

Each legal norm consists of two main elements: a disposition and a sanction. A disposition (*Disposition*) is a rule of conduct in a society. A sanction (*Sanction*) is a rule of conduct of both the subject that has violated the disposition and the state (organization) that is mandated to use the appropriate measure on the violator. The subsidiary elements of legal norms are a disposition hypothesis, a sanction hypothesis and an exception. A disposition hypothesis (*DispositionHypothesis*) is the condition under which a subject has a right or a duty to act according to the disposition. A sanction hypothesis (*SanctionHypothesis*) is the condition of the application of the sanction. Violation of the disposition (a legal offense) is the necessary condition for the application of the sanction, but not the sufficient condition since further conditions may apply. Exception (*Exception*) limits the applicability of a norm.

There are several classes of dispositions. A categorical disposition (*CategoricalDisposition*) is a disposition that describes and prescribes one and only one conduct. An alternative disposition (*AlternativeDisposition*) is a disposition that describes and prescribes one conduct from a set of alternative conducts that a subject can choose. A discretionary disposition (*DiscretionaryDisposition*) is a disposition that empowers a subject to regulate behavior of other subjects. Those classes of dispositions are the subclasses of imperative disposition (*ImperativeDisposition*). A dispositive disposition (*DispositiveDisposition*) is a disposition that describes and prescribes a conduct, but empowers a subject to create another disposition instead. The subject has to comply with the rule of conduct only if he/she does not create another disposition.

Sanctions can also be classified into imperative sanctions (that can further be classified into categorical sanctions, alternative sanctions and discretionary sanctions) and dispositive sanctions, although categorical sanctions are almost exclusively used. The norm element and its subclasses are shown in Figure 6.

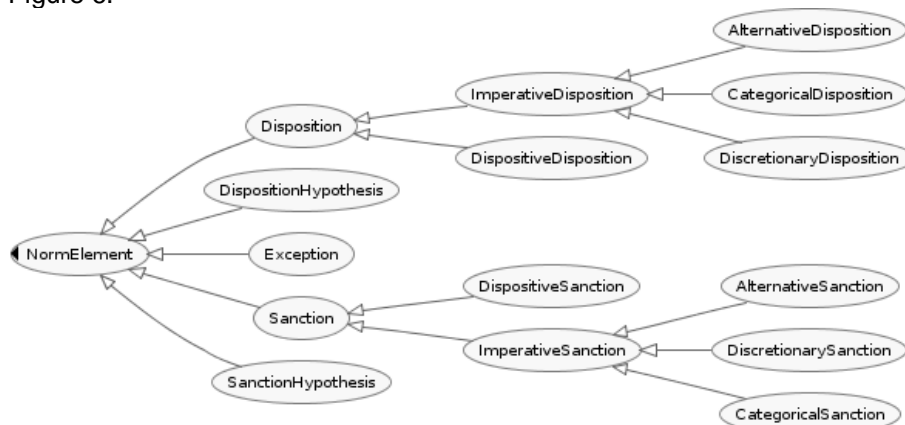


Fig. 6. The legal norm element and its subclasses.

Legal norms do not have textual formulation. Its elements have it. Legal norms are not directly connected with their textual formulations since different elements of legal norms can be contained in different (parts of) legislation. The element of legal norm can be formulated as a plain text or an URI reference to the XML element that formulates the norm element.

The element of a legal norm is used in several ways. Firstly, it is used to connect the content (legal norms) and the form of legislation (its text). Secondly, it is used for browsing legal norms by their elements since different legal norms can share same elements (e.g. different norms can have same sanction, the sanction or the disposition hypothesis of one legal norm can be the disposition of another, etc.).

A legal system (*LegalSystem*) is a set of legal norms arranged in a series of units that are connected with each other in a non-contradictory whole. Those units are a legal norm (*LegalNorm*), a legal institution (*LegalInstitution*), a legal branch (*LegalBranch*) and a legal area (*LegalArea*). A legal institution is a set of legal norms that regulate the same legal relation (or few similar legal relations) with the same policy (e.g. ownership, marriage, privacy, etc.). It should not be confused with an (state) organization although these concepts are related since (state) organizations are created in order to apply legal norms. A legal branch is a set of legal institutions (e.g. civil law, criminal law, family law, etc.). A legal area is a set of legal branches (e.g. public law, private law, national law, international law, etc.).

The purpose of those concepts is to organize legal norms into legal system in an explicit manner. This is made possible by having a property (*isPart*) that

specifies that an individual belonging to one unit is a part of an individual belonging to another unit. The classification elements are shown in Figure 7.

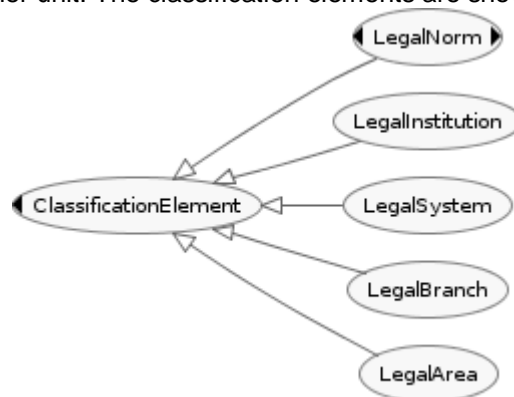


Fig. 7. The classification elements.

Legal norms are also implicitly organized with relations expressed by the Latin phrases *lex posterior derogat legi priori* (more recent law prevails over an inconsistent earlier law), *lex superior derogate legi inferiori* (a superior law prevails over an inconsistent inferior law) and *lex specialis derogat legi generali* (a specific law prevails over an inconsistent general law) that can be inferred from the model. The first relation can be inferred from the dates on which norms entered into force. The second relation can be inferred from the hierarchical relations between legal subjects that enacted legislation that contains norms. The third relation can be inferred from hierarchical relations between legal relations that are regulated by norms.

The structure of the legal system is used for retrieval of legal norms and legislation that formulates it.

A legal fact (*LegalFact*) is a fact that influences creation, modification or termination of legal relations (rights and duties). In other words, it is a fact that has legal consequences. It is usually described by disposition and sanction hypotheses.

An act (*Act*) is a change of state of things that is influenced by an agent (an agent is a subject that acts).

A mental act (*MentalAct*) is a change of mental state of a subject. This change is always influenced by an agent (subject itself), so it is an act.

The term legal act (*LegalAct*) has two main connotations. The first connotation of this term (its content, its subject matter) is a mental act that has legal consequences, that changes state of the legal system by changing legal states of legal subjects (their rights and duties). It has two parts. The main part of its content is a statement of will that has legal consequences. The subsidiary part of its content is the naming of the act itself (usually consisting of the type of the act, the subject that enacted it, legal grounds for its enactment, the place and the time of enactment, the procedure by which it was

enacted, the goal for its enactment, etc.). It is represented with an URI (e.g. accordance with URN:LEX [21] specification).

The second connotation of this term (its form) is the materialization of mental act that has legal consequences, usually expressed by natural language. The form of a legal act is a set of material means with which it is created and expressed. The legal theory distinguishes three main elements of its form: the subject, the procedure and the materialization. The subject is the body that is authorized to enact a legal act. The procedure is what is needed for its enactment. The materialization is the accommodation to sensory perception and expression of the legal act. The legal act and its subclasses are shown in Figure 8.

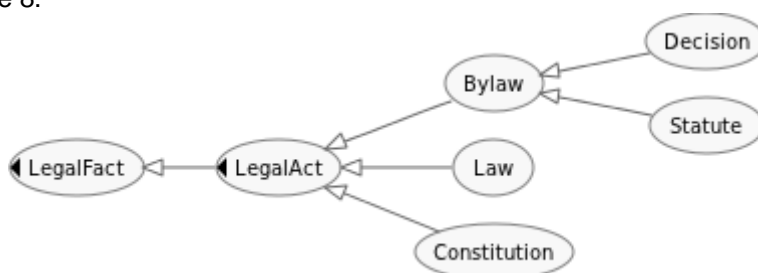


Fig. 8. The different types of legal acts.

Information about the subject, the procedure and the materialization is expressed by properties shown in Figure 9.

- contains (multiple LegalNorm)
- effectiveOn (single date)
- enactedOn (single date)
- isEnacted (single LegalSubject)
- isPromulgated (single LegalSubject)
- isPublished (single Gazette)
- promulgatedOn (single date)
- publishedOn (single date)
- signer (single string)
- type (single string)

Fig. 9. The legal act's properties.

Those properties are used to retrieve legislation and legal norms contained in it (since legal act is explicitly connected with legal norms it contains).

It should be noted that the legal act is not a common term in the English language and countries with the common law legal system in general. For the purpose of this paper, the second connotation of this term, when contains (mostly) abstract and general legal norms, is synonymous with the term legislation.

4. An Example of the Model's Application

The Law on Personal Data Protection [3] of the Republic of Serbia regulates acquisition and processing of data within the context of protecting privacy of individuals.

We have represented both the form and the content of this law. The content of this law (i.e. norms it contains) is represented in RDF according to the OWL model described in Section 3. The modeling procedure is as follows: determine the scope, determine the policy, model social relations in the scope (and its elements), model legal norms that regulate those relations according to the chosen policy (and its elements) and express elements of those norms as plain text or XML. Due to space constraints, the original model of the law expressed in N3 notation is available at [20].

As noted, this system of legal norms is inferred from existing legislation. The procedure could also be reversed. Legislation could be textually formalized starting from the system of legal norms.

The form of this law (textual formulation of norms) is represented using the CEN MetaLex compatible model of legislation similar to the model described in [2].

The CEN MetaLex is intended to impose a standard view of legislation in order to facilitate information exchange and software interoperability. To meet those requirements, the CEN MetaLex defines mechanisms for XML schema extension, addition and extraction of metadata and implementation of identification mechanisms.

The CEN MetaLex schema defines abstract, generic and concrete types and declares abstract and generic elements. Abstract data types correspond to legal documents design patterns [21]. To enable the use of substitution groups in the declaration of conforming elements, the abstract types have corresponding elements. The CEN MetaLex schema contains generic types for each abstract type. Generic elements are declared for each generic type. They may be instantiated. Concrete types are included for all abstract types. They should be used for defining subtypes or elements conforming to the specification. In order to be compliant with the CEN MetaLex specification, each declared element has to be of a concrete type and has to have one of the abstract elements as its substitution head.

Legislative drafting guidelines of the National Assembly of the Republic of Serbia are regulated by [22]. All legislation enacted by the National Assembly has to be written in accordance with those guidelines. According to [22], based on its form, legislation is structured into parts, chapters, sections, subsections, articles, items, points, subpoints and lines. The CEN MetaLex specification has been extended in order to comply with [22]. New elements were declared for each structural parts of legislation. A full XML schema along with several examples of the legislation represented according to this model is available at [20].

The CEN MetaLex metadata is represented by RDF statements (subject, predicate and object). An OWL schema that specifies the allowed values of subjects, predicates and objects has been developed. It defines general con-

cepts, concepts that identify the document and concepts that are citations of other documents [23]. Only the subset of metadata specified in [23] was used in the CEN MetaLex representation of legislation presented in this paper. That subset contains classes and properties that were necessary for naming of legislation. RDFa was used as a method of serialization of RDF triplets.

The CEN MetaLex specification does not define the syntax or the semantics of identifiers. It defines rules that naming conventions must satisfy in order to be compliant with the specification. The CEN MetaLex distinguishes identity of legislation at FRBR [24] work, expression, manifestation and item levels. Feature set has been chosen to identify uniquely legislation at work, expression and manifestation levels. Those features are serialized both into RDF metadata in conformance with [23] and into IRIs of the syntax in conformance with [25].

This representation is straightforward. Each formal element of the legislation (e.g. article, item, point, etc.) is represented by a corresponding XML element that has *id* attribute as a unique identifier. The XML element *provision* represents textual formulation of a part (element) of legal norm. The original document is available at [20].

It is important to notice that the RDF representation of the elements of legal norms (content of legislation) and the XML representation of provisions (form of legislation) are connected with *asURI* property. Therefore, legal norms are connected with their formulations (elements of legislation), while legislation is connected with its content (legal norms).

The duality between the form and the content of legislation was used as a basis for developing a prototype expert system for semantic browsing of legislation. It stores legislation as XML documents in accordance with the CEN MetaLex specification and legal norms as RDF triplets in accordance with the model described in this paper. The usage of this prototype is described in the remaining of this section.

User interface of the prototype consists of several tabs. Legislation is shown in *Content* tab. It contains several views that can be shown by pressing button \gg or hidden by pressing button \ll . Furthermore, it is possible to show the table of content (*Table of Content* tab), the list of attachments (*Attachments* tab), the list of bylaws (*Bylaws* tab) and the legislation metadata (*Metadata* tab). The table of contents and the list of attachments are automatically generated from the XML representation of legislation. The list of bylaws and the legislation metadata are automatically generated from the RDF representation of norms contained in legislation.

Legislation can be browsed by form or by content. It is browsed by form simply by following textual hyperlinks between different elements of legislation (articles, items, points, etc.) or different legislation altogether.

Ontological Model of Legal Norms for Creating and Using Legislation

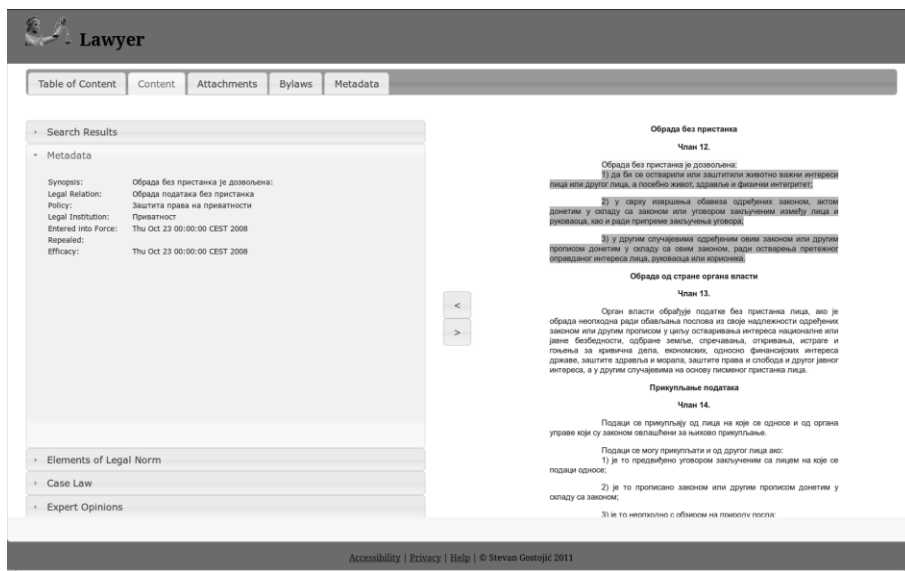


Fig. 10. Metadata view.



Fig. 11. Elements of Legal Norm view.

Browsing by content is facilitated in the following way. When a provision that formulates an element of a legal norm is clicked, provisions that formulate all the elements of that legal norm are shown in different colors - disposition is yellow, disposition hypothesis is lime, sanction is aqua, sanction hypothesis is fuchsia and exception is silver. The *Metadata* view displays norm metadata

(Figure 10). The *Elements of Legal Norm* view displays a list of elements of this norm (Figure 11). When an element of this norm is clicked, its textual formulation is shown in the *Content* tab. The *Search Results* view displays a list of legal norms that contains the elements formulated by the provision that was clicked (Figure 12). When a legal norm from the list of legal norms displayed in the *Search Results* view is clicked, it is displayed in the similar manner. The *Case Law* view displays a list of case laws that are related to the selected norms. Similarly, the *Expert Opinions* view displays a list of expert opinions related to the selected norms.

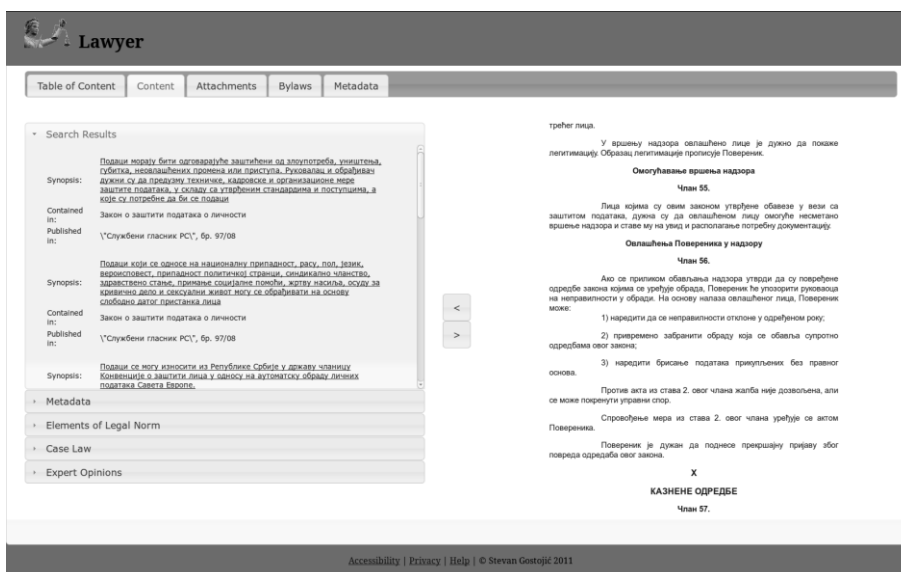


Fig. 12. Search Results view.

5. Conclusion

This article describes a formal model of legal norms developed using OWL. It is intended for semiautomatic drafting of legislation from a system of legal norms it contains and semantic retrieval and browsing of legislation annotated with the information about legal norms they contain. The model is verified by applying it to an existing piece of legislation and by developing a prototype application intended for semantic browsing of legislation that can solve the problem of legal rule fragmentation.

The main contribution of the paper is the adoption of the structural view of the legal system and subsequent definition of all relevant concepts of the model using the elements of the legal relation and the elements of the legal norm. While reviewed ontologies connect legal norm with the action or behavior of the legal subject it describes or prescribes, we connect it with legal rela-

tions they regulate. To the best of our knowledge, no other model of legal norms used this approach.

Nevertheless, modeling of a system of legal norms contained in legislation requires considerable time and expertise. Apart from being acquainted with OWL and the described model, a person responsible for this task is required to be an expert in normalized legal drafting as well as in the area that is being regulated. Therefore, our future work is directed in two complementary directions.

There are multiple research projects with the goal to develop legislative drafting environment [26], but the semiautomatic application of legislative drafting guidelines is on the rudimentary level. None of those tools supports semiautomatic drafting of legislation starting from its semantics. One possible solution to this problem is the use of a modeling tool that can generate draft legislation from the model of a system of legal norms. That way, apart from improving drafting process and the quality of resulting legislation, a model of a system of legal norms would be a byproduct of the drafting process. Drafting of legislation can be automated to some extent by transforming the model of a system of legal norms in accordance with the described formalism, using transformations described in specific legislative drafting guidelines, to the model of legislation in accordance with the CEN MetaLex specification (cf. [1]). Although this process cannot be completely automatic, the structure of the draft legislation can be a considerable help to the legislative drafter and annotated legislation can be used for semantic retrieval and browsing.

Retrieval and browsing of legislation can be facilitated by exploiting duality of legislation and legal norms and the structure of the legal relation, the legal norm and the legal system. Developing a prototype expert system for semantic retrieval of legislation is a natural continuation of the research on browsing of legislation. Semantic retrieval is based on the meaning of legislation (the legal norms contained in it).

Furthermore, the model could be expanded to include specific and concrete legal norms, although that can effect computing properties of the model since the expanded model would not necessary be the OWL DL model. Ontology presented in this paper can be integrated with existing (legal) ontologies, although this was not the focus of the research described in this paper.

Acknowledgments. The research presented in this paper was financed by the Ministry of Education and Science of the Republic of Serbia as part of the research project "Intelligent Systems for Software Product Development and Business Support based on Models" (grant no. 44010). The authors would also like to thank anonymous reviewers for suggestions that considerably improved the quality of the paper.

References

1. Biagioli, C., Cappelli, A., Francesconi, E. and Turchi, F.: Law Making Environment: Perspectives. In: Biagioli, C., Francesconi, E. and Sartor, G. (eds.): Proceedings

- of the V Legislative XML Workshop, European Press Academic Publishing, Florence, 267–283. (2007)
2. Gostojić, S., Milosavljević, B. and Konjović, Z.: Modeling MetaLex/CEN Compliant Legal Acts. In: Szakal, A. (ed.): Proceedings of the 8th International Symposium on Intelligent Systems and Informatics, IEEE, New York, 285–290. (2010)
 3. Law on Personal Data Protection (“Službeni glasnik RS”, br. 97/2008, 104/2009). (in Serbian)
 4. Biagioli, C. and Grossi, D.: Formal Aspects of Legislative Meta-drafting. In: Francesconi, E., Sartor, G. and Tiscornia, D. (eds.): Proceeding of the 2008 Conference on Legal Knowledge and Information Systems: JURIX 2008: The Twenty-First Annual Conference, IOS Press, Amsterdam, The Netherlands, 192–201. (2008)
 5. Sartor, G.: A Formal Model of Legal Argumentation. *Ratio Juris*, Vol. 7 No. 2, 177–211. (1994)
 6. Gordon, T.: The Legal Knowledge Interchange Format (LKIF). University of Amsterdam, Amsterdam, The Netherlands. (2008)
 7. Kralingen, R.: A Conceptual Frame-based Ontology for the Law. In Proceedings of the First International Workshop on Legal Ontologies, University of Melbourne, Melbourne, 15-22. (1997)
 8. Breuker, J. and Hoekstra, R.: Epistemology and Ontology in Core Ontologies: FOLaw and LRI-Core, Two Core Ontologies for Law. In: Gangemi, A. and Borgo, S. (eds.): Proceedings of the Workshop on Core Ontologies in Ontology Engineering, RWTH, Aachen, 15-27. (2004)
 9. Gangemi, A.: Design Patterns for Legal Ontology Construction. In: Casanovas, P., Biasiotti, M., Francesconi, E. and Sagri, M. (eds.): Proceedings of the 2nd Workshop on Legal Ontologies and Artificial Intelligence Techniques, RWTH, Aachen, 65-85. (2008)
 10. Rubino, R., Rotolo, A. and Sartor, G.: An OWL Ontology of Fundamental Legal Concepts. In: van Engers, T. (ed.): Proceeding of the 2006 Conference on Legal Knowledge and Information Systems: JURIX 2006: The Nineteenth Annual Conference, IOS Press, Amsterdam, 101–110. (2006)
 11. Breuker, J., Hoekstra, R., Boer, A., van den Berg, K., Sartor, G., Rubino, R., Wyner, A., Bench-Capon, T. and Palmirani, M.: Deliverable 1.4: OWL Ontology of Basic Legal Concepts (LKIF-Core). University of Amsterdam, Amsterdam, The Netherlands. (2007)
 12. Valente, A., Breuker, J., Brouwer, B.: Legal Modeling and Automated Reasoning with ON-LINE. *International Journal of Human-Computer Studies*, Vol. 51, No. 6, 1079–1125 (1999)
 13. <http://www.estrellaproject.org> (current 1 June 2011)
 14. Olbrich, S. and Simon, C.: Process Modelling Towards e-Government – Visualisation and Semantic Modelling of Legal Regulations as Executable Process Sets. *Electronic Journal of e-Government*, Vol. 6 No. 1, 43–54. (2008)
 15. Lukić, R. and Košutić, B.: Introduction to Law, IRO Naučna knjiga, Belgrade, Serbia. (1988) (in Serbian)
 16. Vukadinović, G.: Theory of State and Law, Futura publikacije, Novi Sad, Serbia. (2006) (in Serbian)
 17. Pajvančić, M.: Legislative Drafting, Advokatska komora Vojvodine, Novi Sad, Serbia. (1995) (in Serbian)
 18. Masolo, C., Borgo, S., Gangemi, A., Guarino, N., Oltramari, A. and Schneider, L.: Deliverable 1.7: The WonderWeb Library of Foundational Ontologies and the DOLCE ontology. ISTC-CNR, Padova, Italy (2002)

19. Gruber, T. Toward Principles for the Design of Ontologies Used for Knowledge Sharing: International Journal of Human-Computer Studies, Vol. 43 No. 5–6, 907–928 (1995)
20. <http://informatika.ftn.uns.ac.rs/legal> (current 1 June 2011)
21. Vitali, F., Di Iorio, A. and Gubellini, D.: Design Patterns for Descriptive Document Substructures. Paper presented at The 2005 Extreme Markup Languages Conference, 1–5 August 2005, Montréal. (2005)
22. Legislative Drafting Guidelines (“Službeni glasnik RS”, br. 21/2010). (in Serbian)
23. <http://svn.metalex.eu/svn/MetaLexWS/branches/latest/metalex-cen.owl> (current 1 June 2011).
24. International Federation of Library Associations and Institutions: Functional Requirements for Bibliographic Records, International Federation of Library Associations and Institutions, The Hague, The Netherlands (2007). Available: <http://www.ifla.org/en/publications/functional-requirements-for-bibliographic-records> (current 1 June 2011)
25. Spinosa, P., Francesconi, E. and Lupo, C.: A uniform resource name (URN) namespace for sources of law (LEX). Internet Engineering Task Force, Fremont (2011)
26. Arsovski, S., Konjovic, Z., Milosavljevic, B., Gostojic, S.: „Legislative editors based on open standards and open source. YUINFO 2010, Kopaonik, Serbia (2010)

Stevan Gostojić has a Ph.D. in electrical engineering and computer science from University of Novi Sad. Currently, he works as an assistant professor at Faculty of Technical Sciences in Novi Sad. His research interests are legal informatics, e-government, document management, business process management, distributed computing, WWW, XML and semantic web.

Branko Milosavljević is an Associate Professor in the Faculty of Technical Sciences, University of Novi Sad, Serbia, where he earned his doctoral degree in Computer Science. His research interests include information retrieval, document management, access control, and digital libraries.

Zora Konjović is Full Professor in the Faculty of Technical Sciences, Novi Sad, Serbia. Dr. Konjović received her Bachelor degree in Mathematics from the University of Novi Sad, Faculty of Science and Master degree and Ph. D. degree both in Robotics from the University of Novi Sad, Faculty of Technical Sciences. She has participated in six scientific and more than thirty professional projects; she was the project leader for five of these. Dr. Konjović has published more than 180 scientific and professional papers.

Received: August 04, 2011; Accepted: July 02, 2012.

