Legal Ontology of Sales Law Application to eCommerce

John W Bagby
Pennsylvania State University
jbagby@ist.psu.edu

Tracy Mullen
Pennsylvania State University
tmullen@ist.psu.edu

abstract

Legal codes, such as the Uniform Commercial Code (UCC) examined in this article, are good points of entry for AI and ontology work because of their more straightforward adaptability to relationship linking and rules-based encoding. However, approaches relying on encoding solely on formal code structure are incomplete, missing the rich experience of practitioner expertise that identifies key relationships and decision criteria often supplied by experienced practitioners and process experts from various disciplines (e.g., sociology, political economics, logistics, operations research). This research focuses on the UCC because it transcends the limitations of a formal code, functioning essentially as a composite. AI work can benefit from real-world codes like the UCC, which are essentially formal codes enlightened from a more realistic experience-base from centuries of development in international settings. This paper then describes our initial work in converting an expert system on the law governing the sale of goods, Article II of the Uniform Commercial Code (UCC), into a knowledge-based system using the Web Ontology Language OWL.

1. Introduction

Artificial intelligence (AI) techniques have spread only slowly into the domains of law, regulation and public policy. From time to time, prototype expert systems are devised but many provide, at best, mixed results. The perspective of this research is that artificial intelligence in law is inherently interdisciplinary. Successful projects in artificial intelligence and ontologies require domain expertise in both law and artificial intelligence. Domain expertise in law is derived from two sources: legal experts in the formal law and process theorists representing various disciplines. Codes, such as the Uniform Commercial Code (UCC) examined in this article, are good points of entry for AI and ontology work because of their more straightforward adaptability to relationship linking and rules-based encoding. However, approaches relying on encoding solely on formal code structure are incomplete, missing the rich experience of practitioner expertise that identifies key relationships and decision criteria often supplied by experienced practitioners and process experts from various disciplines (e.g., sociology, political economics, logistics, operations research). This research focuses on the UCC because it transcends the limitations of a formal code, functioning essentially as a composite because of the UCC's rather unique heritage. The UCC was derived from the Law Merchant and Lex Mercatoria, codifications of actual practice rather than normative codes drafted by inexperienced legislators. Therefore, AI work on real-world codes like the UCC is benefited by the straightforward coding advantages of codes but enlightened with a more realistic experience-base from centuries of development in international settings.

This paper then describes our initial work in converting an expert system on the law governing the sale of goods, Article II of the Uniform Commercial Code (UCC), into a knowledge-based system using the Web Ontology Language OWL with Jess as our inference engine.

2. Some Commercial Successes in Developing Legal Ontologies

Despite the enormous hurdles to comprehensive and robust AI in the domains of law, regulation and public policy, some interesting experiments have been conducted and a few notable functional systems still operative. For example, there are some complex but deterministic systems successfully deployed in specific sub-domains of law, regulation and public policy. Consider the rules-based systems in commercially available tax preparation applications, some running as native software and others successfully operating from online applications service providers (ASP) - the latter

including government as the ASP: the United States Internal Revenue Service (IRS). Rather considerable progress in user assistance has characterized the primary legal research databases (Lexis, Westlaw) in the United States (U.S.). Online legal databases leverage the traditional ontologies in law and regulation, develop and deploy cross-reference links, expand computer-aided search through natural language, filters and sense-making. Finally, there are numerous electronic government transaction processing systems throughout the world. For example, many taxing authorities assist taxpayers with AI technologies, licensing authorities process transactions, intellectual property (IP) authorities provide research assistance and manage complex transaction processing.

New services developed by legal research databases may be good predictors of successful AI and ontology work in law for three reasons. First, they already have deployed AI research assistance as discussed above. Second, as private-sector, for profit information service providers, they can be expected to invest in AI innovation where there is reliable cash flow potential. Third, they are already fulfilling the promise of AI in large, complex environments by providing context-sensitive advice on information seeking, including significant access to actual reliable sources. For example, the online legal database services have largely mechanized and enhancing traditional finding strategies, although largely using variations and context sensitive enhancements of key word in context search and retrieval. Nevertheless, these services are adding functionality, such as natural language queries rather than exclusively traditional Boolean approaches, with relevance prioritization and reliability measures, and pragmatic resumption of prior line of research and reasoning. Of particular importance are context-sensitive and tangentially-linked relations to supplementary information. The most recent AI advances permit users to easily access context-sensitive and subject-sensitive information that broaden understanding. AI contributes greatly to human expert analysis by organizing terabytes of esoteric information, providing mechanized search and retrieval and providing expert assistance for further information seeking and retrieval.

3. Challenges Developing AI in Law

The development of more complex, reasoning-based applications in law, regulation and public policy may be impeded by the structure of legal knowledge. Law is generally unlike many other learned professions and scientific domains that have knowledge bases derived from empirical research and consensus heuristics generally proven to work well. Clearly this open textured domain requires more sophisticated AI techniques to classify, link and automate reasoning in the domains of law, regulation and public policy. For these reasons, further AI developments in law, regulation and public policy may require much more concentrated effort in representing legal rules, case interpretations and practitioner insights in ontologies.

There are constraints on expert systems and AI applications where they may impact the rights of individuals or entities. While judgments or decisions resulting from AI inference hold promise for improving human reasoning, particularly from the exhaustive capacity for search, it can be expected that early AI efforts in law will be imperfect as a complete substitute for the advice of experienced human practitioners [Hassett]. For example, Lamkin found that there may be legal liability for the owner or operator of an expert system in medical information and that this could lead to liability for misdiagnosis or other treatment errors [Lamkin]. No reasonable basis for distinction from the medical context exists to shield AI systems in law from similar liability for information quality or even malpractice.

Judge Posner provides relevant clues into the difficulties any AI system will likely have in producing accurate predictions of legal outcomes or even helping to identify the reasoning that might lead to decisions in legislation, regulatory action or litigation. His comments are sobering for building ontologies with a primary view to providing efficient solutions, essentially relegating them to assistants useful in organizing and seeking information.

“The first step in deciding a tough antitrust case, a case not controlled by precedent, is to extract (not -- it goes without saying -- by a deductive process), from the relevant legislative texts and history, from the institutional characteristics of courts and legislatures, and, lacking definitive guidance from these sources, from a social vision as well, an overall concept of antitrust law to guide decision. ... All

this is true; and it is right to emphasize, against the facile skepticism that is merely the opposite (and equally untenable) pole of syllogism-mongering, that even though interpretation is neither a logical nor a scientific process it yields true understandings in most cases, including most legal cases."

[Posner]

Most of the existing AI experiments in law recognize that this enormity of legal knowledge is derived from formal law in constitutions, statutes and regulations; as interpreted by case law precedents; and finally interpreted through the experience of many domain experts. Law differs in states/provinces, among nations and between affiliated trading groups in international commerce. Law libraries are filled with statutes, legislative history, regulations and cases issued by thousands of discrete authorities. Nevertheless, undaunted, many computer and information scientists as well as legal scholars have chosen to break law down into manageable-sized sub-domains more susceptible to internal consistency and coherence and less effected by external domains. For example, Groothuis postulates that expert systems could be constructed to provide advice and decision support for sub-domains such as the government administered social insurance experiment in the Netherlands [Groothuis]. Another working experiment includes the decision support application of expert systems in New York to assist prosecutors in choosing from among many cases for the investment of resources such as investigators, attorneys and office staff [Hassett]. Yet another narrow domain example is the assessment of evidence in litigation by Levitt [Levitt, et. al.] .

4. Toward Legal Ontologies Accurately Reflecting both Formal Rules and Actual Practice

AI and ontologies in the law hold strong promise to organize legal research, as well as inform legal reasoning for improving the quality of legal decisions, advice and research. According to Rissland: "AI focuses a spotlight on issues of knowledge and process to a degree not found in non-computational approaches." [Rissland] Accurate representation of the law is essential to meaningful and useful AI in law. According to Aikenhead "It is obviously a prerequisite to know what the nature of law is and what the process of legal reasoning involved before incorporating legal knowledge in a computer and making the computer manipulate that knowledge to emulate the legal reasoning process, i.e., the results achieved by lawyers." [Aikenhead]

Legal ontologies become robust only in as much as they are able to enrich the more deterministic structure of context and interpretation available in statutory law. Case interpretations are a fundamental difference between the law of nations adhering to the common law approach (nations deriving legal traditions from England) and the nations using the civil law approach (nations adhering to the largely legislative approach of the continental European nations and the nations they colonized). In modern practice around the world, the governing statutes are the starting place for AI work.

There are two levels of domain knowledge beyond the formal statutory framework that are relevant for robust AI in law. First, the case law interpretations, just mentioned, add authoritative detail but are subject to interpretation. Second, heuristics of seasoned practitioners, regulators, litigators, judges, legislators, sociologists, and political economists can all provide relevant heuristics. For example, Aoki et. al. used an existing general ontology enhanced by a case ontology automatically constructed from precedents input by the user in International commerce governed by the Vienna Convention on the International Sales of Goods (CISG) [Aoki, et. al.].

The accuracy, relevance and predictability of AI in law is enhanced with detail provided in cases and judgments derived from experienced experts who can provide heuristics based on probability assessments. Legal ontologies are improved with experience. Baker argues for the superiority of experiential learning, citing creation of AI ontologies ex post as inferior source of for human learning [Baker].

5. Toward Commercial Law as an Optimal Blend of Formal Specificity and Reliable Compilation of Experience

Few statutes have ever been written intending to be searched, analyzed or modified by computers, other than with simple word processors. The benefits of having a domain designed with modular organization are simply non-existent in most na-

tion's laws and highly unlikely to be constructed in the near to medium term for industrialized nations. Blackwel argues for the benefits of object-oriented analysis and design in AI as an ideal structure for analysis of problems involving "complex relationships among distinct concepts. [Such a] structure will allow close consistency with both the real-world situations addressed, and the legal principles applied, by the statute." [Blackwel]

Nevertheless, the organization of some statutes transcends the hodge-podge, historical accumulation of political compromises often typified by the Internal Revenue Code in the United States. Indeed, the Law Merchant and its progeny, the United States' Uniform Commercial Code (UCC), separately legislated by all 50 U.S. state legislatures, is a model of two important factors that may improve its potential for adaptation through ontologies into AI systems. First, the UCC is composed of well-organized rules derived from best practice experience from centuries of actual conduct. The UCC is therefore a codification following practice significantly bridging the gap between prescribed conduct and actual behavior. As a result, an ontology based on the UCC is already more robust because it includes many details from experience. Second, the UCC has a form of modular composition, again derived from experience, enabling manageable analysis and ontological representation. The CISG is very similar to the UCC, and increasingly promises to apply the benefits of this model's generality to the sale of international goods and the ecommerce commerce domains.

6. Our Model Transformation

By providing an explicit representation of the semantics for domain concepts and properties, ontologies can be used for knowledge sharing and reuse among both humans and software agents. In the Semantic Web vision [Berners-Lee], humans and computers can easily collaborate because the necessary information and process knowledge has been given a well-defined meaning, via ontologies, that allows for intelligent automation by software agents. Research efforts in the legal domain, aimed at fostering a semantic web approach, have taken on the problem from two different, but complimentary, directions. Kabilan and Johannesson [Kabilan et. al.] focus on building a "lawyer's ontology". They conform to the legal terms and rules drawn from international contract law, and represent those in a conceptual model using the Unified Modeling Language (UML)[UML]. UML can then be transformed into various semantic web ontology languages. SweetDeal [Grosof et. al.] embraces the "law in practice" or process-based approach based on actual practice for representing legal contracts. They use the MIT Process Handbook, which details business process knowledge actually used by industry business process designers, and represent the business process knowledge using semantic web languages such as DAML+OIL [DAML+OIL] andRuleML [RuleML]. Thus, intelligent software agents can have a larger potential role in automating creating, assessing, negotiating and performing such contracts.

In day to day legal practice, processes are derived from both the existing law, from experience, and from various cultural, political, and economic factors. When the law must be applied to new areas, such as ecommerce, the law relies on both extending past standards and on incorporating new business practices through a case-by-case "learning" process. We believe that both approaches are naturally linked, and that they must be for the semantic web vision to be achieved in the area of contract law. As our first step, we focused on building a composite "lawyer's ontology" refined with law from actual practice because of the unique hybrid capabilities offered by the US-based UCC commerce code.

The starting point for our work is a series of UCC-based expert systems built in the late 1980's [Bagby]. These expert systems evaluate contract performance, and suggest possible remedies for various kinds of non-performance. They were meant to be used by lawyers who understand basic domain concepts such that every contract involves a buyer and seller, each of whom can be either merchants or non-merchants, and so forth. Thus our first step in transforming these expert systems into knowledge-based systems requires incorporating the de jure formal terms and rules in the UCC Article II into a legal ontology.

We are using the OWL Web Ontology Language [OWL], and developing the ontology in Protégé [Noy et. al.]. When possible, we document each

term's usage in UCC Article II by its section number. In Figure 1, we show the paraphrased description for the term Merchant and its UCC citation [UCC 2-104]. Ideally, in the future, we would be able link to a Legal Dictionary such as the European Legal RDF Dictionary [LEXML]. Figure 2 shows our current prototype UCC ontology displayed graphically. Our next steps are 1) to further define properties and property restrictions, and 2) to incorporate Jess (via JessTab in Protégé [Eriksson]) to reason over individual contracts. In step 2, we will start by essentially recreating the existing expert systems, but defining the rules based on the underlying ontology terms rather than on human understanding.

7. Conclusion

In this paper, we describe our initial research investigation into representing the UCC commercial laws as a legal ontology. Once this work is completed, the authors plan on extending the UCC commercial laws into the emerging rules of electronic commerce with a view to examining the implications to planning, execution, and dispute resolution for electronic commerce transactions. For example, three frameworks in international commerce appear to be natural objects to extend this method. First, the Vienna Conventional for the International Sale of Goods (CISG) has many notable similarities to the Law Mechant, Lex Mercatoria and the UCC particularly as compendiums of successful actual practice. Second, several sources of electronic commerce laws have been implemented in the European Union and the United States. For example, the EU Directive in Electronic Commerce (Dir 2000/31/EC) and the U.S. form, Electronic Transactions Action (UETA) are developing sufficient rigor to deserve attention, particularly given their focus on automated transactions, concluded by electronic means including electronic agent activities. Follow on work will address the impact of deploying intelligent software agents as full-fledged legal persons engaged in these types of transactions.

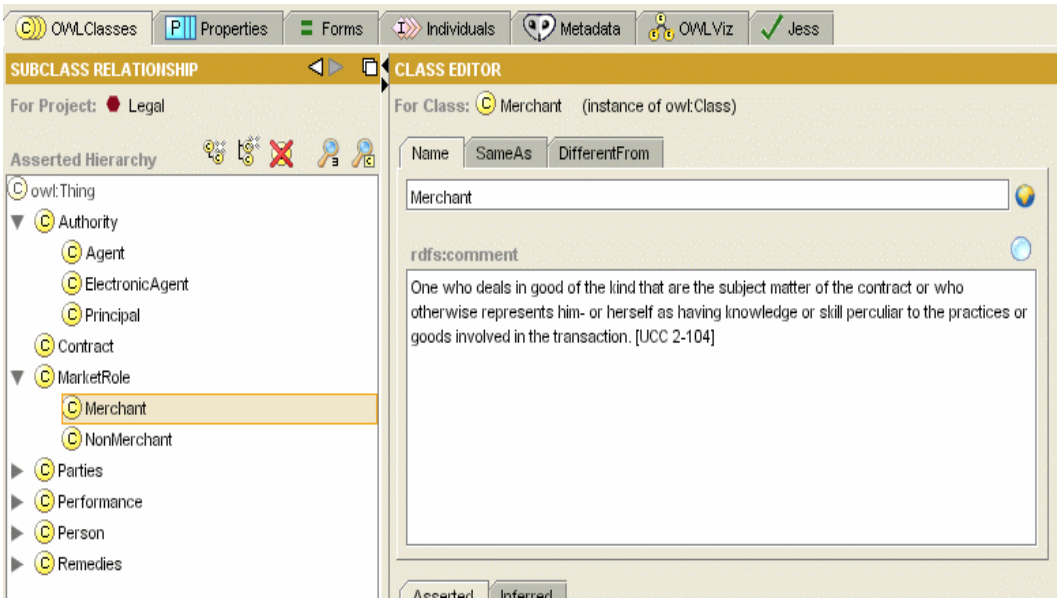

Figure 1: Example of UCC-derived Term Definition for the term Merchant

Figure 2. Prototype UCC Article II Ontology

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