Chapter 12
Indexing as an Ontological Support for Legal Reasoning

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ABSTRACT
Legal reasoning is still insufficiently understood. Formalisations of legal reasoning have failed so far, due in particular to the non-consideration of societal and legal complexity. Thus, the network of cooperative reasoning and its compilation and analysis should be represented by an index of legal and fact concepts of a legal ontology. The Dynamic Electronic Legal Commentary (DynELCom) constitutes such a semantic description and analysis of the legal information system. Knowledge acquisition tools support the establishment and refinement of the extensive ontology. Since a first ontology exists in European law, international law and Austrian law, this chapter also presents early experiments on EU state aid law which show the feasibility of the approach. Next steps will be a deep refinement of the ontology and the development of a dialogue system.

INTRODUCTION
New research slightly takes the veil of legal work and explains how lawyers cope with the vast body of legal materials, interpret it, apply it and – taking into account its underlying principles – develop the law. Law is handicraft and art but – still in development – also applied science. Since the 1970s, information and communication technology has played a major role of a catalyzer for applied research on law. Results are still premature as investment and acceptance of these endeavours remains insufficient. However, legal information systems have already changed the way lawyers handle legal documents, information and knowledge. Legal reasoning – the holy grail of lawyering – has been so far only slightly touched by automation aims.

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Lions of documents, the gigabytes of data, 100,000 and more rules etc. and the resulting information crisis of law. Secondly, it refers to the complexity of today’s society and the ongoing globalisation, where information technology and internet provide one of the main fundamentals. Thirdly, it refers to the main reason of existence of law – the reduction of social complexity by governance.

Lawyers have to reduce social and legal complexity in order to achieve manageable containers of complexity. This can be a legal case, a domain of specialization, a co-operation of knowledge workers, some outsourcing etc.

It should be evident that automated legal reasoning should achieve the same level of mastering legal complexity, e.g. not handling only a very small subset of the legal order, a simple regulation like the Library Regulations but a particular domain of the law. This sub domain can be defined by quantity (e.g. a high number of cases) or quality (e.g. the law for a particular business or an administrative task). So far, theoretical and practical research has not sufficiently taken into account this requirement. Resulting "nascituri" of prototypes have strongly embarrassed lawyers and are responsible for the present low appraisal of this research in lawyer’s circles.

Information retrieval can collect all materials and provide hints for relevant information. Legal reasoning requires agents able to handle a tremendous complexity in law and society. Human beings, e.g. lawyers, cope with the complexity with specialization (and longer working hours). Intelligent software agents can handle only standard cases so far. Thus, the complex social reality has to be sufficiently reduced for automating legal reasoning.

What can be the next step? Considering AI research, a sufficiently intelligent legal software agent may see the world in about 50 years. The main obstacle is not the complexity of reasoning but the required very high standards of natural language understanding and interpretation of visual input.

Thus, we argue for a simplified model of reasoning based on advanced indexing. As a well-known tool of reduction of information, indexing is heavily used in books, libraries and retrieval systems. It will provide much more support than just information retrieval. Given “established reasoning”, indexing may offer a sufficiently strong link between facts and rules in order to support semi-automated handling of standard cases.

This approach is based on established technologies. Text of the law is available in legal information systems. Legal ontologies provide a specification of a juridical domain in a computer usable way. World ontologies describe persons, objects, situations and events in the world. Techniques of indexing, summarisation and categorisation support a semi-automatic description and analysis of the text corpus of a legal information system; solving the problem of the bottleneck of knowledge acquisition.

Such an approach relies heavily on collaborative reasoning in a given legal domain. The various positions of legal authorities, in particular parliaments, courts, government offices, and legal authors are compiled and put into a coherent system.

These tools systematically put together, form the core of an indexing tool of legal situations, acts, concepts, rules and principles called Dynamic Electronic Legal Commentary (DynELCom). Similar to its paper counterpart, it describes the law in an analytical structure. However, it is semi-automatic and dynamic, e.g. update is done on a daily basis supported by automatic indexing and categorisation. Further, it includes much more factual descriptions. The main value of a commentary, the index, is properly formalised and thus better understandable. Graphical structures help the lawyers, the formalisation the computers. Thus, a computer-useable structured description will offer a “simplified syllogism” for automated reasoning in standard cases. It is then up to legal practice to implement these “simplified syllogisms” in knowledge systems, dialog systems etc.
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