Review:

"Legal Expert" Project

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Since 1992, about 30 Japanese lawyers and computer scientists have been intensively engaged in a project of systematizing and computerizing legal reasoning. This project is the Study of Development of a Legal Expert System - Exploration of Legal Knowledge Structure and Implementation of Legal Reasoning or, in short, the "Legal Expert" Project. In this paper, I would like to introduce the Legal Expert project, explaining the goals, study organizations and their tasks in constructing legal expert systems in Japan.1

Keywords: Artificial intelligence, Law, Legal expert system, Legal knowledge, Project

1. Introduction

Legal knowledge is becoming enormous and complicated as statutes, precedents, and theories have accumulated. The application of computer science to the field of law requires progress. With the advance of artificial intelligence (AI) research, the field of law has become the most favorable for applied research. It has become possible for us to introduce science and technology dealing with knowledge to the field of law to clarify the structure of legal knowledge and to establish a scientific method for legal studies and legal practice. We are now developing legal expert systems as AI to assist legal education and legal practice.

Since 1992 about 30 Japanese lawyers and computer scientists have been intensively engaged in a project of systematizing and computerizing legal reasoning. This project is the Study of Development of a Legal Expert System - Exploration of Legal Knowledge Structure and Implementation of Legal Reasoning, or in short the "Legal Expert" Project. I am director of this project on AI in law in Japan. This project has been funded as Important Research Area Number 109 of a Grant-in-Aid for Scientific Research by the Japanese Ministry of Education, Science and Culture. The project is scheduled from May 1992 to March 1998. Therefore an "accelerated" project will go on for more than a year. The present project includes about 17 researchers in the field of law (jurisprudence, civil law, etc.), 12 in computer science and knowledge engineering, and 4 in basic disciplines of human thought (logic, psychology, etc.).

In this paper, I would like to introduce Legal Expert project. Namely, I would like to describe the goals, study organizations, and their tasks of the present "Legal Expert" project on constructing legal expert systems in Japan.2

2. Goals of the project

A legal expert system is fed the knowledge of lawyers and can infer from law together with the facts of a given case and output what legal judgment should be made under the contemporary system of law when a case in question is input. It explains what the legal knowledge is and what structure it has.

The aims of this research project are, first, to clarify the structure of legal knowledge and, second, to develop a prototype of a legal expert system as AI, which realizes legal reasoning. In this study, law is regarded as knowledge. The first and second aims are closely interrelated. For the second purpose of the study, it is necessary to realize the first purpose of the study. The second purpose promotes the realization of the first purpose. To realize these two main aims, interdisciplinary research by law study, logic linguistics, and computer science and knowledge engineering are organized in this project. This research gets more excellent results because it is interdisciplinary.

The study has the following 4 main objectives:

1) Clarifying the general structures of legal knowledge,

2) Clarifying the precise structures of concrete legal knowledge in the field of contract law, especially United Nations Convention on Contracts for the International Sale of Goods (CISG),

3) Describing the structure of legal knowledge in logical formulas to build up a CISG legal knowledge base, and

4) Developing other software of a legal expert system, i.e., inference engines, knowledge acquisition support systems, and user interfaces.

These 4 objectives are integrated to realize the two main goals of the project, i.e., 1. to clarify the structure of legal knowledge and 2. to develop an AI prototype of a legal expert system. The two goals are related and contribute to each other as described above. (Fig.1)

1 Thereafter, I would like to report the present results of our project described by clarifying the structure of legal knowledge, according to which legal reasoning is performed, on the one hand; and in terms of constructing legal expert system software to realize legal reasoning, on the other hand (chapter 4). I conclude my paper by pointing out the significance of this research.

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3. Organization of the project and tasks

According to the 4 objectives above, this project consists of 4 study groups, each of which has its own specialized tasks, and one general integrated group. (Fig. 1) I would like to explain each of the study groups and their tasks in the following section.

9 General Group

The general integrated group deals with integrated research on the Development of a Legal Expert System. It integrates the studies of Groups A01 through A04. Twelve scholars belong to this general group, most of whom belong to one of Groups A01 through A04. The particular tasks of this general group are as follows: 1. to participate in the planning of the research for each group; 2. to supervise the process and integrate the results of each group toward the construction of a legal expert system; 3. to design the legal expert system as a whole; 4. to commission programming from companies and control their work; 5. to experiment with the system; 6. to evaluate it; 7. to control the outcome of research and regulate it in use; 8. to summarize and publish the findings of the overall studies of this project.

A01 "Clarification of the General Structure of Legal Knowledge"

This research does not deal with a concrete positive system of law, but with law in general, which is in common with every positive law. The attempt to clarify the structure of law in general will also help clarify the structure of a certain positive system of law and vice versa, seven scholars belong to this group. This research has the following aims: 1. the structure and function of legal propositions; 2. the structure of a legal system; and 3. the structure of legal inference.

These are subjects of the general theory of law, such as legal philosophy and legal sociology. Conceptual Jurisprudence, General Jurisprudence, Interest Jurisprudence, Analytical Jurisprudence, Pure Theory of Law, Realistic Jurisprudence, Empirical Jurisprudence, and so forth, have laid down these subjects each from its own viewpoint. It is important for this research to reexamine the results of studies mentioned above from new points of view. It is also important to approach these subjects by applying the views and methods of basic disciplines concerning human thought such as mathematics, logic, statistics, psychology, and so on. To make the application of these more effective, we can expect that the methods of these disciplines themselves will be examined by the researchers of basic disciplines. What is more important, there can also be approaches referring to the results and trends of recent law and AI research. Eight scholars belong to this group.

A02 "Clarification of the Knowledge Structure of Positive Law"

This research clarifies in detail the concrete knowledge of certain positive systems of law. As mentioned above, law is regarded as a knowledge here. The content of the knowledge of positive law has always been ascertained by the study of positive law such as the study of civil or criminal law. In this study, we will confirm the knowledge of positive law from the viewpoint of and through the method of conventional study of positive law and describe content. Here, interpretative and legislative argument is important. It is necessary, however, to have a classification of legal knowledge (statutes, precedents, theories, legal "common sense", and so on) and also to clarify the systematic structure of knowledge according to time, place, and persons involved. The targeted field of law of this research is contract law, especially CISG.

A03 "Construction of the Legal Knowledge Base"

The aim of this study is to input the knowledge of positive law, analyzed in detail, into computers and to construct a legal knowledge base. In this study, we construct a legal knowledge base, regarding the results of the analysis of the knowledge structure of the above fields of law. In this process, we reexamine the general and concrete structure of legal knowledge from the viewpoint of constructing a legal knowledge base. We examine methods to represent legal knowledge and the structure of the legal knowledge base. It is hard work, both technically and practically, to acquire legal knowledge and to equip the knowledge base with it. Therefore, a supplementary system to acquire knowledge is needed. We have developed a supplementary system for constructing the legal knowledge base. Using this system, legal knowledge is installed as a rule with the structure of legal requirement (legal effect), cases which are the result of legal judgment on past events and an electronic dictionary of legal concepts.

As to the variety of precedents and theories, we are constructing a system such that one can get more than one answer from the unified viewpoint of the system constructor, and different answers from the different points of view of legal scholars and courts. The system should also be able to deal with the relative validity of legal knowledge to flexibly infer differences of time and place, according to which the force of a law changes. The knowledge base has legal metaknowledge, which is knowledge about knowledge, so that the system can realize legal metareasoning, which controls legal reasoning. In the knowledge base, we install legal knowledge from which reasoning of legal justification can be performed. Thirteen scholars belong to this group.

A04 "Construction of the Software for a Legal Expert System"

This research deals with the construction of a legal expert system software, excluding the knowledge bases, treated in Group A03; ten scholars belong to this group. As the basic software of a legal expert system, this group develops (1) a legal inference engine, (2) 9 a system to control legal knowledge and assist in the acquisition of legal knowledge, and (3) user interface. The tasks of the study (1) are to decide on a database reference model and install the legal inference engine; realize functions such as deductive proof for the inference of legal justification, legal analogy and interpretation as the inference of legal discovery, fuzzy inference in accordance with the ambiguity of legal terms, and a debugging system; (2) to install a system assisting legal knowledge representation and acquisition in cooperation with Group A03; (3) to study a mainly natural language interface, designing the limited language of legal sentences and to construct a system for the translation and reverse translation from this limited language of legal sentences to internal representation within the system.

4. Conclusion

The project has progressed satisfactorily under the leadership of the general group. The structure of legal knowledge has been clarified fairly well. The first prototype version of our legal expert system was made and now we are constructing the second prototype, in which all subsystems developed by research project are integrated. I would like, however, to leave the explanation about the study results of the project to a later occasion.

I would like to conclude this paper emphasizing the following: our research in the present Legal Expert Project could, on the one hand, contribute to making the study of law scientific by introducing the methods of information and knowledge technology into the field of law and its practice, and, on the other hand, develop new possibilities for knowledge science and technology.

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