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## Editorial for Special Issue:

# AI and Law



**Hajime Yoshino**

Faculty of Law, Meiji Gakuin University  
1-2-37 Shirokanedai, Minatoku, Tokyo 108, Japan  
E-mail: yoshino@mh.meijigakuin.ac.jp



**Katsumi Nitta**

Department of Computational Intelligence and Systems Science,  
Tokyo Institute of Technology  
4259 Nagatsuta, Midori-ku, Yokohama 226, Japan  
E-mail: nitta@dis.titech.ac.jp

Lawyers use a reasoning process known as legal reasoning to solve legal problems. Legal expert systems could potentially help lawyers solve legal problems more quickly and adequately, enable students to study law at school or at home more easily, and help legal scholars and professionals analyze the law and legal systems more clearly and precisely.

In 1992, Hajime Yoshino of Meiji Gakuin University started a "Legal Expert Systems" project. This "Legal Expert" project is funded by the Japanese Ministry of Education, Science and Culture and is scheduled to run from May 1992 to March 1998. Yoshino organized over 30 lawyers and computer scientists to clarify legal knowledge and develop legal expert systems.

This project covers a wide range of technologies such as the analysis of legal knowledge, the analysis of legal rules on international trade (United Nations Convention on Contracts for International Sale of Goods (CISG)), legal knowledge representation, legal inference models, utility programs to develop legal knowledge bases, and user interfaces. This project, which ends in March 1998, will focus on developing comprehensive legal expert systems as the final product. In this issue, we present 12 papers written by "Legal Expert" project members.

In this number, Hajime Yoshino gives an overview of the legal expert systems project, explaining its aims, objectives, and organization. Six papers that follow his introduction include three on case-based reasoning. Legal rules are given by ambiguous predicates, making it difficult sometimes to determine whether conditions for rules are satisfied by the facts given of an event. In such cases, lawyers often refer to old cases and generate hypotheses through analogical reasoning.

Kaoru Hirota, Hajime Yoshino and Ming Qiang Xu apply fuzzy theory to case-based reasoning. A number of related systems have been developed, but most focus on qualitative similarities between old cases and the current case, and cannot measure quantitative similarities. Hirota et al. treat quantitative similarity by applying fuzzy theory, explaining their method using CISG examples.

Ken Satoh developed a way to compute an interpretation of undefined propositions in a legal rule using adversarial case-based reasoning. He translated old cases giving possible interpretations for a proposition into clauses in abductive logic programming and introduced abducibles to reason dynamically about important factors in a old case to the interpretation

suited the user's purpose.

Yoshiaki Okubo and Makoto Haraguchi formalized a way of attacking legal argument. Assume that an opponent has constructed a legal argument by applying a statute with an analogical interpretation. From the viewpoint of legal stability, the same statute for similar cases should be applied with the same interpretation. We thereby create a hypothetical case similar to the case in question and examine whether the statute can be interpreted analogically. Such a hypothetically similar case is created with the help of a goal-dependent abstraction framework. If a precedent in which a statute has been applied to a case with a different interpretation -- particularly complete interpretation -- can be found, the opponent's argument is attacked by pointing out the incoherence of its interpretation of the statute.

Takashi Kanai and Susumu Kunifuji proposed a legal reasoning system using abductive logic programming that deals with ambiguities in described facts and exceptions not described in articles. They examined the problems to be resolved to develop legal knowledge bases through abductive logic programming, e.g., how to select ambiguities to be treated in abductive reasoning, how to describe time relationships, and how to describe an exception in terms of the application of abductive logic programming to legal reasoning.

Toshiko Wakaki, Ken Satoh, and Katsumi Nitta presented an approach of reasoning about dynamic preferences in the framework of circumscription based on logic programming. To treat dynamic preferences correctly is required in legal reasoning to handle metarules such as *lex posterior*. This has become a hotly discussed topic in legal reasoning and more general nonmonotonic reasoning. Comparisons of their method, Brewka's approach, and Prakken and Sartor's approach are discussed.

Hiroyuki Matsumoto proposed a general legal reasoning model and a way of describing legal knowledge systematically. He applied his method to Japanese Maritime Traffic Law.

Six more papers are to be presented in the next number.

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## "Legal Expert" Project

Hajime Yoshino

Meiji Gakuin University, Faculty of Law  
1-2-37 Shirokanedai, Minatoku, Tokyo 108, Japan  
E-mail: yoshino@mh.meijigakuin.ac.jp

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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.<sup>1</sup>

**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 could 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 is 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. Thereafter an "aftercare" project will go on one more 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 will describe the goals, study organiza-

tions, and their tasks of the present "Legal Expert" project on constructing legal expert systems in Japan.

### 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 is, 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)

<sup>1</sup> 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.