Annales UMCS Informatica AI 6 (2007) 57-63

Annales UMCS
Informatica
Lublin-Polonia
Sectio AI

http://www.annales.umcs.lublin.pl/

Supporting of legal decisions

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Abstract

Producers of legal software most frequently offer legal texts explorers with no possibilities of interpreting legal acts. Therefore, one of the aims of this work is to create and research a tool which could help actively to avoid the user's necessity to interpret the legal text. Another aim of the work is selection of a suitable legal base, and analysis of possibilities of realization of expert system supporting legal decisions.

1. Introduction

The life of a man in society is regulated by law. Along with the progress of civilization, law seems to influence a whole variety of aspects of everyday life which results in legal paragraphs becoming more and more complicated. Practically almost every aspect of human activity is regulated by law. Although the idea of utilization of the computer tools to support the legal decisions is not new, it is constantly being developed. The problem of artificial intelligence tools utilization in supporting legal decisions was a subject of a long debate and was analyzed from many different points of view. The discussion is described precisely in [1]. Despite some critical papers [2] focusing mainly on the jurisprudential matter, many successful projects were accomplished [1,3-7].

Legal acts are characterized by different level of generality and some of them should be as precise as possible without any discretion of interpretation of the rules. Such acts are much easier to translate into knowledge base. They allow to avoid problems of ambiguity and interpretation of legal rules as well.

Expert systems can be considered useful in the case of aiding legal decisions. Some of the most crucial properties of an expert system are separation of knowledge and inference engine as well as open and readable knowledge in the

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knowledge base. The above mentioned features create possibilities for expressing legal regulations in the form of a knowledge base.

The problem of supporting legal decisions has not been popular in Polish literature so far. In fact, this topic appears only in [8-10]. Nevertheless, we can also trace some articles discussing related topics (for example [11]).

The producers of legal software most frequently offer legal texts explorers with no possibilities of interpreting legal acts [12]. Therefore, one of the aims of this work is to create such a tool which could help actively to avoid the user's necessity to interpret the legal text. Such system aims at facilitating the user by means of omitting the plain text of a legal act and at providing a direct interpretation of the paragraphs.

Another aim of the work is selection of a suitable legal base, and analysis of possibilities of accomplishment of expert system supporting legal decisions.

2. The problem

Most of the decision-supporting computer tools for lawyers are only browsers of legal acts without any possibility of interpreting the rules. In this work the author is trying to make a step forward to prepare such a tool which could give legal advise to the user. The task requires focusing not only on the plain legal text but on interpretation of a legal act as well. Such interpretation should be represented in the form of knowledge base.

3. Legal Acts

Legal acts have different levels of complexity and generality. In order to create an expert system supporting legal assessment, a constructor should realize that an expert system will not be able to provide an interpretation equal that one provided by a human expert. Legal acts implemented in the expert system should be of a deterministic nature in which there is no place for free interpretation of a given rule. To exemplify the case, tax law should have such properties in which every rule would be clear and have only one interpretation. Therefore, the author of this work has decided to implement the legal act of November 15, 1984 of agricultural tax [13], into the expert system.

4. Tool

A classical rule based expert system has been used to build the decision support system. Knowledge (legal acts and their interpretation) is represented as "if... then...." rules without possibility of uncertain knowledge representation (which is, in this specific problem, useless). The way of knowledge representation adequate to a given problem is strictly dependent on its specific properties. Advisory systems usually use the rule based expert systems which

are suitable for such a purpose. For example the problem of supporting the credit granting decisions is quite similar to that supporting legal decisions and, moreover, most of the expert systems aiding credit granting decisions use rule based knowledge representation [14,15]. Such a way of knowledge representation is also used by numerous legal expert systems (in those systems representing the statute law) [1,3,8-10]. It is essential for knowledge used in the legal expert system to have deterministic character. Such a feature allows to build a complete knowledge base and secure against contradictions.

5. Knowledge base and inference engine

The system uses classical ”if...then...” rules to represent knowledge. Because of the fact that in the legal act concerning the matter of agricultural tax some notions of “numerical knowledge” dealing with the ways of calculating taxes can be found, it is obvious that the system should also have possibilities to represent such knowledge.

The system consists of 340 declared attributes, most of which are symbolic. There are, however, some attributes with a numerical character as well. Apart from that, the knowledge base is built of 278 rules.

All rules in the knowledge base are divided into 6 groups related to major topics regulated by the act:

1. Should a person pay an agricultural tax (conditions of being agricultural tax payer).
2. Amount of agricultural tax.
3. Possibilities of changing taxing district.
4. Dates of applications delivery.
5. Dates of paying tax rates.
6. Rules of applying and paying agricultural tax.

The above mentioned points constitute the final conclusions of these groups of rules. Additionally, some of these conclusions are used (with minor modifications) as the conditions in other groups of rules.

There are two major kinds of inference engines that are used in the expert system: forward chaining and backward chaining. Forward chaining allows to receive all possible conclusions from the given input data, whereas backward chaining allows to verify a given hypothesis. In the case of the legal problems forward chaining provides us with much useless information (sometimes even wrong information because of the lack of data). Backward chaining appears to be much more useful for such a purpose. In the course of the process the user puts the hypothesis and the input data into the system and consequently, a given hypothesis is verified.

6. Example of inferencing process

Many kinds of property of agricultural areas can be acknowledged. They are related to various ways of delivering application for the tax duty, various ways of paying the tax and various tax payers. The subsequent problem can serve as an example: rules of applying and paying agricultural tax:

Inference process starts with providing the user with a group of questions. Each of these questions presents a choice of possible answers out of which the user has to choose one (or more if it is possible).

The system asks the following questions:

1. Does a given person possess the land?
   Possible answers:
   a) yes
   b) no
2. Is a given person an owner of the land?
   Possible answers:
   a) yes
   b) no
3. Is a given person a natural person?
   Possible answers:
   a) yes
   b) no
4. Is a given person co owner of the land?
   Possible answers:
   a) yes
   b) no
5. Is a given person a co-owner of the land, managing the whole agricultural farm?
   Possible answers:
   a) yes
   b) no
6. Who are other co-owners?
   Possible answers (at this question system allows to give more than one answer):
   a) natural persons
   b) legal body
   c) non-legal personality individuals.

After this section the system presents the results of inferencing about the topics:

1. Rules of applying of agricultural tax
2. Which of the co-owners should the tax office send a call of payment to?

It should be notified that the inference process is not always the same. In the cases in which some of the answers are redundant, the system does not have to ask all of the questions.

7. A quick glance at the inference process

Agricultural tax law has a very practical nature and therefore the expert system constructed in this work can be helpful to the "users" of legal regulations (agricultural tax payers; tax collectors; local authorities). Such a kind of system cannot provide too much help for legislators, since the system is rather the transfer of a legal act into the advisory system than a universal representation of a legal act in the computer. Utilization of rule based knowledge representation results in focusing upon the advisory nature of a system.

Conclusions

Legal acts have various levels of abstraction. Many of them use fuzzy, ambiguous, and difficult to express (especially in the computer system) ideas, which makes construction of such a system a very difficult task (but the most interesting one at the same time). As it was mentioned before, some of legal acts should be as precise as it is possible. Tax law belongs to the group of deterministic legal acts in the case of which any possibilities of free interpretation should be declined.

A knowledge engineer building a knowledge base for legal expert system faces a very difficult situation: on one hand he is provided with the whole knowledge expressed explicitly in the legal act (which may seem an advantage). On the other hand, there is danger that a transfer of the act into the knowledge base can slightly change the meaning of the act. Limitation of knowledge representation is another factor that may influence the meaning. For these reasons constructing of such a system is a much more difficult task than it initially seemed to be.

The first idea of "system supporting legal decisions" should be revised, especially the idea of the universal representation of a legal act in the computer. At first it is important to consider a potential user of such a system: should it be a qualified lawyer solving scientific legal problems (preparing such a system is extremely difficult because of vagueness and fuzziness of the subject matter); or should it be an "ordinary user" of the legal act e. g.: an agricultural tax payer, a tax collector, or a lawyer rendering his service.

Expert systems are tools which cannot do more than human expert can. However, they are useful in situations in which many decisions concerning the same topic should be made. Therefore, supporting legal decisions for such "ordinary people" is a much more suitable task for a legal expert system. In

addition, preparing knowledge base for the expert system is usually a very money-, labor-, and time-consuming task, which is the reason why developing the system for such potential users has economic importance as well.

The next important decision concerns the purpose of the system. Consultative character of the system should be the reason for choice of suitable knowledge representation. Such advisory systems usually use the rule based knowledge representation which is suitable for solving the problems like: "what should I do". The same knowledge representation was used in the system supporting decisions in the matter of agricultural tax. As it was described before, it is very difficult (probably impossible) to create a universal system which would solve any legal problem regulated by this act. Therefore, a knowledge engineer has to predict potential problems of a user. If the range of problems regulated by the act is narrow, the task is usually easy (like in a legal act about agricultural tax), however, in the case of more complex acts it can generate many serious difficulties.

Another important remark is connected with the way of inferencing. The legal expert system draws conclusions based strictly on the legal rules, which is formally proper, but it may sometimes result in contradicting the general idea of the legal act. The inference engine does not "understand" the problem in the way humans do and therefore cannot see any subtleties in the analyzed cases. In fact, such a system is only able to infer in the simple way, relying on precisely formulated knowledge without drawing any deeper or general conclusions. Notwithstanding this fact, such a legal expert system can be very useful for aiding simple legal evaluations in most common cases.

The system supporting legal decisions presented in this paper is the research prototype. The article presents the initial conclusions inferred during the process of constructing the system. In the course of further research the above discussed system is going to be developed, tested, and verified.

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