Expert Systems in Law and the Representation of Legal Knowledge: Can we isolate it from the Why and the Who?

Paper presented at the Third International Congress on:
Logica, Informatica, Diritto: Expert Systems in Law
under the main topic: Expert Systems in Session 2:
Representation of knowledge and legal Systems

by
Claude Thomasset
Professor of Law
Member of the Computer Science and Law Research Group (GRID)
University of Québec in Montréal

and
Louis-Claude Paquin
Researcher
Member of the Computer-Assisted Text Analysis Center (ATO)
University of Québec in Montréal
C.P.8888 Succ. A
Montréal (Québec)
Canada, H3C 3P8

Introduction. 1. The Why and the Who: stating choices. 1.1. The why and the who of mainstream expert systems in law. 1.2. Legal knowledge for non lawyers. 1.3. Technological choices. 2. LOGE-Expert, legal expert system for non-expert users. 2.1. Historical perspectives. 2.2. The design of the LOGE-Expert interface. 2.3. The legal nucleus. 2.4. The communicational layers. 3. A legal expert system for non-experts : legal and technological issues. 3.1. Matching human beings, legal knowledge and computers. 3.2. Macro and micro modelization of legal knowledge. Conclusion.

Introduction

Why do we build legal expert systems and who will be the specific users? Does the choice of a specific type of user influence the way we build an expert system in law? Is it possible to create expert systems in law oriented towards the general population? Can expert systems in law be a vehicle for disseminating legal knowledge monopolized by legal experts, among laymen? When we decided to build LOGE-EXPERT (Home Expert), our aim was to investigate the capabilities of computers and the possibilities of AI applied to Law, in order to evaluate their efficiency in the process of disseminating legal knowledge among laymen. (Thomasset, C., Hébert, R., 1988). At that time we made then specific choices about the legal domain and legal expert system users which did not correspond to the usual way of building an expert system in Law (Susskind, R., 1987). We did not select a legal domain in which a consensus among lawyers exists, and we did not aim our project at experts who are generally the users of most of well-known legal Expert systems (Boston, 1987; Vancouver 1989).

What are the consequences of these choices on the modelization of our specific legal knowledge? What are the constraints they impose on software?

We will present our experiment in three parts. The first one will explain our legal domain and technological choices; the second one will describe our prototype: LOGE-EXPERT (Home Expert); the third one will evaluate the feasibility of a legal expert system for non-lawyers.

l. The Why and the Who: Stating choices

1.1 The why and the who of mainstream Expert Systems in Law.

Expert systems in law are generally built for lawyers (Boston, 1987; Bologne, 1989, Vancouver, 1989) and are produced by researchers from theoretical perspectives on the formalization of legal knowledge (Bench - Capon, T.J.M. and A, 1987, 1989; Gardner, Van der Lieth, A., 1987, Martino, A.A., 1987, MacCarty, L.T., 1977, 1989; Smith, J.C. and Deedman, G.S., 1987, Sprowl, J.A., 1984; Susskind, R., 1987). Nevertheless some Expert Systems in Law are now in use on an experimental basis (Susskind, R., 1989, cf: Vancouver). A trend towards practically oriented expert systems in law, over the last two years (Boston 1987, Vancouver 1989) can be seen in legal fields which may be characterized as belonging to the broad administration of justice such as Social laws and sentencing (cf.: Vancouver 1989). Research into Artificial Intelligence applied to law is now looking for practical applications to facilitate the administration of criminal justice and the implementation of bureaucratized social programs. The why and the who of Research in AI and Law are now more explicit than they were in earlier work, but concern over their impact on the legal system and society are generally missing. For our part, we decided to create a prototype of an expert system in Québec Housing Law oriented towards non-lawyers in order to help people solve conflicts in their landlord-tenant relationships. The why and the who are clearly defined, but we are working at the edge of the mainstream in AI research applied to law. We want to explore the feasibility of such an expert system in law and evaluate the constraints we will meet in such an experiment as a result of our choice of type of user.

1.2 Legal knowledge for non-lawyers

Along with T. Vamos (1987), we opted for "A.I. as a vehicle for a more advanced democracy". We wanted to explore the way we can use expert systems in law to propagate legal knowledge to the general population. (Thomasset, C. Hébert, R., 1988).

1.2.1 Legal knowledge

We opted for the field of Québec Housing Law for three main reasons. Firstly, everyone is faced with a housing problem at least once. Housing Law is a legal domain which affects people in their day-to-day life. Generally Housing Laws are part of socially oriented legislation which tries to introduce more equity into fields where social needs are evident. Québec Housing Law is a new legal field which has grown from sections of the Québec Civil Code over the last fifty years to

become an organized legal field with its own laws, regulations and tribunal (Thomasset, C., 1987a, 1987b, 1988). With no less than 70,000 cases per year, the Québec Housing Tribunal (La Régie du logement du Québec) receives more demands than any other tribunal or court in Québec.

Secondly, bad landlord-tenant relationships are often the result of misunderstanding each other's rights and obligations. We hypothesized that more accessible legal knowledge about Housing Law would help people settle their landlord-tenant conflicts in a more positive way than any tribunal could. Thirdly, legal expertise was accessible since one of the researchers is specialized in Québec Housing Law.

1.2.2 Non-lawyers

Legal Expert systems for non-lawyers do not exist. Why have we chosen non-experts as users for our prototype? As we stated earlier, we wanted to investigate the feasibility of propagating legal knowledge to the general population through new technological means. We expected that a legal expert system would be a good means of giving people safe and accurate information about their Landlord-tenant relationships, at any time and in accessible places, even at home (ALEX, MINITEL). We know that existing expert systems in law increase in efficiency with the degree of expertise of the user (Susskind, R., 1987, Vancouver, 1989). We intend to try to build expert systems in law, not only for lawyers but also for the use of the general population. We expect to encounter some technical problems related to our choice, but we are prepared to cope with them and to evaluate the relationships between ends and means.

1.3 Technological choices

Richard E. Susskind (1987) made a valuable inventory of prototypes of expert systems in law, according to their different characteristics. We have chosen the technology of expert systems for several reasons. First of all, it has given us the opportunity to be more autonomous in modelizing our legal knowledge. We do not need to rely on a computer scientist to successfully modelize our domain of legal expertise. It allows us to spend more time on modelizing problems than on communicating with a computer scientist in order to explain the specificity of legal knowledge. Expert system technology separates legal from computational expertise. A legal expert can manipulate the cognitive structures of the expert system in order to build the knowledge base himself. It enables the externalization of legal concepts (such as contracts, parties, obligations...) as well as of the critical path. A legal expert can master computers without any training as a computer scientist.

Expert systems are able to manipulate non-quantitative problems, which eliminates the use of normative methods of developing systems operating in programming languages. As a result, we can work on specific legal problems even if their solutions are not completely formulated.

Expert systems are tools which offer different perspectives on legal reasoning as well as on legal knowledge modelization. With their simulation capabilities, they induce feedbacks on the legal expertise itself. Circular reasoning, contradictions or legal gaps may appear in the process. They are helpful in investigating alternative solutions to a specific legal problem. When we are confronted with a legal problem, the system searches all the possible solutions and offers certainty factors to help in choosing among the alternative solutions proposed.
Once the expert system technology has been chosen, we still have to make a decision about the computational means we will use. Programming languages and shells constitute the opposing poles on a continuum of technological solutions.

Choosing a programming language would have brought us to shift our focus to computational problems rather than to issues in modelizing legal knowledge. To the contrary of a programming language option, building inference rules does not need any specific training.

The shell we need must offer the option of programming specific packages required for our legal knowledge modelization. We are currently testing D_Expert, an expert system shell which was developed at our university. Moreover its interface and its documentation are in French. Its author is a member of our research team, which allows us to tailor the shell to the needs of our specific legal field and of our own scientific purposes.
D_Expert is written in LE LISP (Paquin, L.C., 1987a, 1987b). The knowledge representation is based on valuated objects called "granules". A granule corresponds to concepts and basic information which represent knowledge units. Granules are characterized by the values of their traits (features). Several "granules" may be grouped into "bases". The granules can be considered as frames without procedures and can be linked one to the each other, in order to express conceptual hierarchy. In the D_Expert shell, an expert system is built into two phases. First, a dictionary must be constructed in which each concept must be defined in terms of granules. For each trait of those granules, all the values must be enumerated. Then inferences rules and facts are constructed by selecting one granule in the dictionary and choosing a value for each of its traits. At any time, the concept included in the dictionary can be modified. A device then propagates the changes to the rules and facts. We have succeeded in modelizing the legal concepts pertinent to the limited legal knowledge required for the creation of our LOGE-Expert prototype.

The knowledge editor is characterized by nested menus and no knowledge of programming language is needed. The inference engine is forward-chaining and enables actions other then inferences, such as calculus or database interactions. The search tree is swept breadth first, which means that all the solutions are found. It is a monotonous inference engine: the inferences cannot be extracted without the inferences which they in turn have induced.

D_Expert, being itself at the prototype stage, needs improvement to some aspects. Its main weakness comes from the LISP programming language in which it is written. We anticipate to recode it in PASCAL or in C and converting its tree data structure into records. It will then need less memory space, facilitating the use of micro computers while accelerating its working speed and will enable connection to videotext servers such as ALEX. D_Expert runs on Macintosh computers (2.5 mgb), on IBM/OS2 (3 mgb) as well as on VAX/VMS. We are now running D_Expert on a Macintosh IIX and plan to distribute LOGE-Expert on PC compatible /DOS (640K).

2- LOGE-EXPERT, a legal expert system for non-expert users

Having stated our choices, we will first present the prototype we are working on. Secondly we will focus on the design of the interface. In our third point we will look at the "legal nucleus", and finally, we will turn to the "communicational layers".

2.1 Historical perspectives

We built LOGE-EXPERT (Home-Expert) in two stages (Thomasset, C., 1989). In the first we formalized the legal knowledge required to build relevant inferences about residential leases. LOGE-EXPERT I succeeded in modelizing leading legal concepts from the theory of obligations of which residential leases are a part, to some extent. Legal knowledge formalization into D_Expert or other shell cognitive structures compels us to state explicitly the fundamental principles of the legal domain under modelization. It imposes a process of standardization of legal and non legal concepts. It is necessary to feed the legal knowledge base with a comprehensive description of the legal domain in order to make accurate inferences.

LOGE-EXPERT II, using the LOGE-EXPERT I legal knowledge base, focuses on repossession, a specific domain of conflict in landlord-tenant relationships.

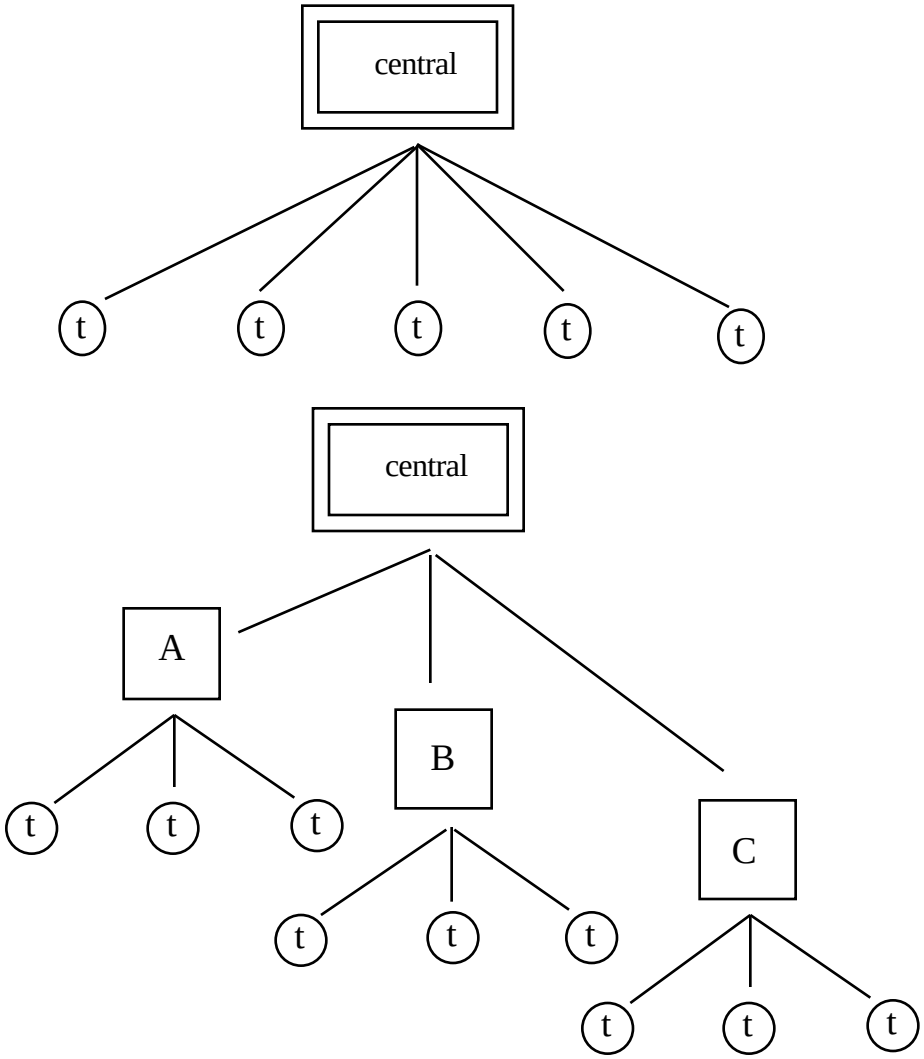
We chose the problem of termination of the residential lease for the landlord's use after a thorough analysis of the most frequent residential lease conflicts. This problem confronts two principles set

out in the Québec Civil Code: the tenant's right to stay in his dwelling and the landlord's right of ownership. Legal prescriptions to set up that conflict are described in the Québec Civil Code, while their interpretation is formulated by Tribunal decisions. Contrary to most prototypes of expert systems in law, these two legal sources are not modelized as such; instead we worked on legal expert knowledge which refers to them. Legal sources are used as arguments to validate legal expert statements about repossession. We will elaborate on the legal nucleus of the prototype, under point 2.3. In order to cope with our focus on non-expert users, LOGE-EXPERT II has brought us to pay a particular attention to the ergonomy of the interface needed to make it attractive to the general population. It leads us to think about "communicational layers" which we will describe in point 2.4. In point 2.2, we will present the design of our LOGE-Expert interface.

2.2. The design of the LOGE-Expert Interface.

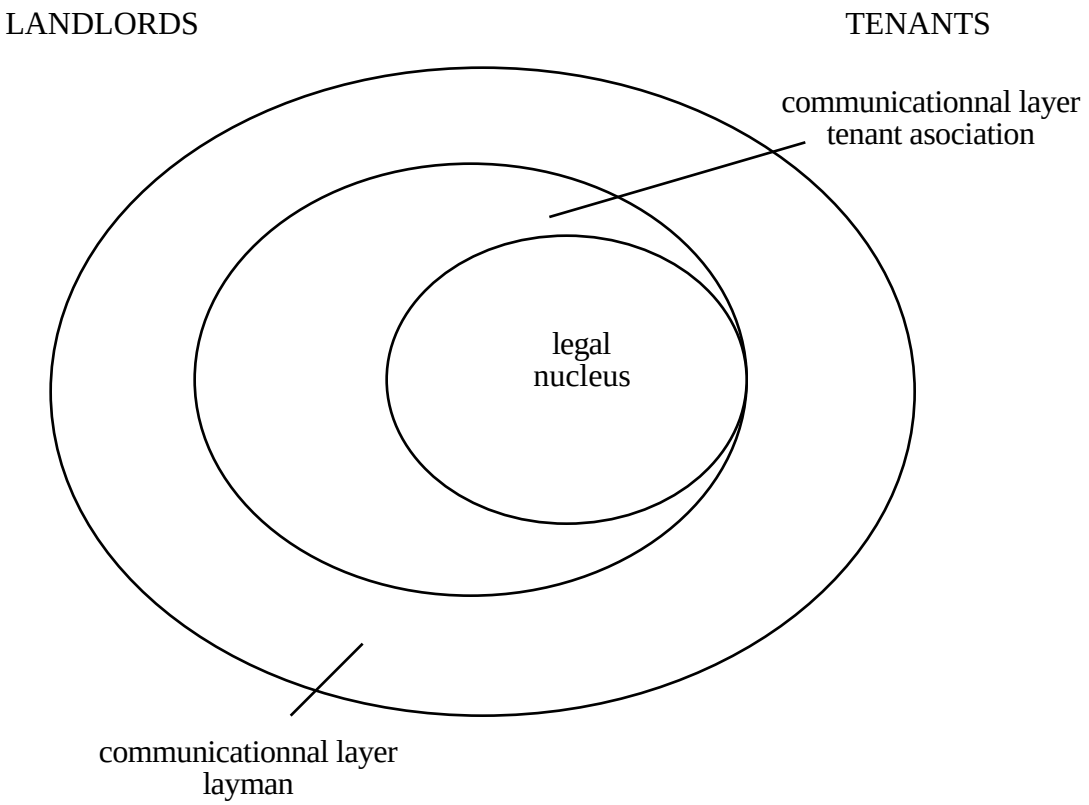
We have designed communicational layers for non-expert user access to the legal nucleus of LOGE-EXPERT. Most expert systems run on micro computers. Nevertheless, they usually have interfaces designed in the same way as those of mainframes from the late seventies. We think that there are other ways of building man-machine interfaces. Figure I illustrates the conventional interface as well as the innovative one.

Figure 1



A, B, and C represent different interfaces for a unique expert system. They could be in the form of a hardware (chips) as well as software. Expert systems users are not a homogeneous group. Some of them know much about the expertise of the expert system, some know a little, and some know nothing. We may built a specific interface for each of these user categories. Figure 2 illustrates that situation.

Figure 2



The legal nucleus is surrounded by layers where different kinds of users (landlords, tenants, tenant or landlord associations) find an adequate interface to get to the essential expertise.
The independence of the legal nucleus from the communicational layers guaranties better management of each of them. It makes accessibility to different kinds of users possible. It enables an interface to be designed to fit with each category of user.

2.3 The legal nucleus

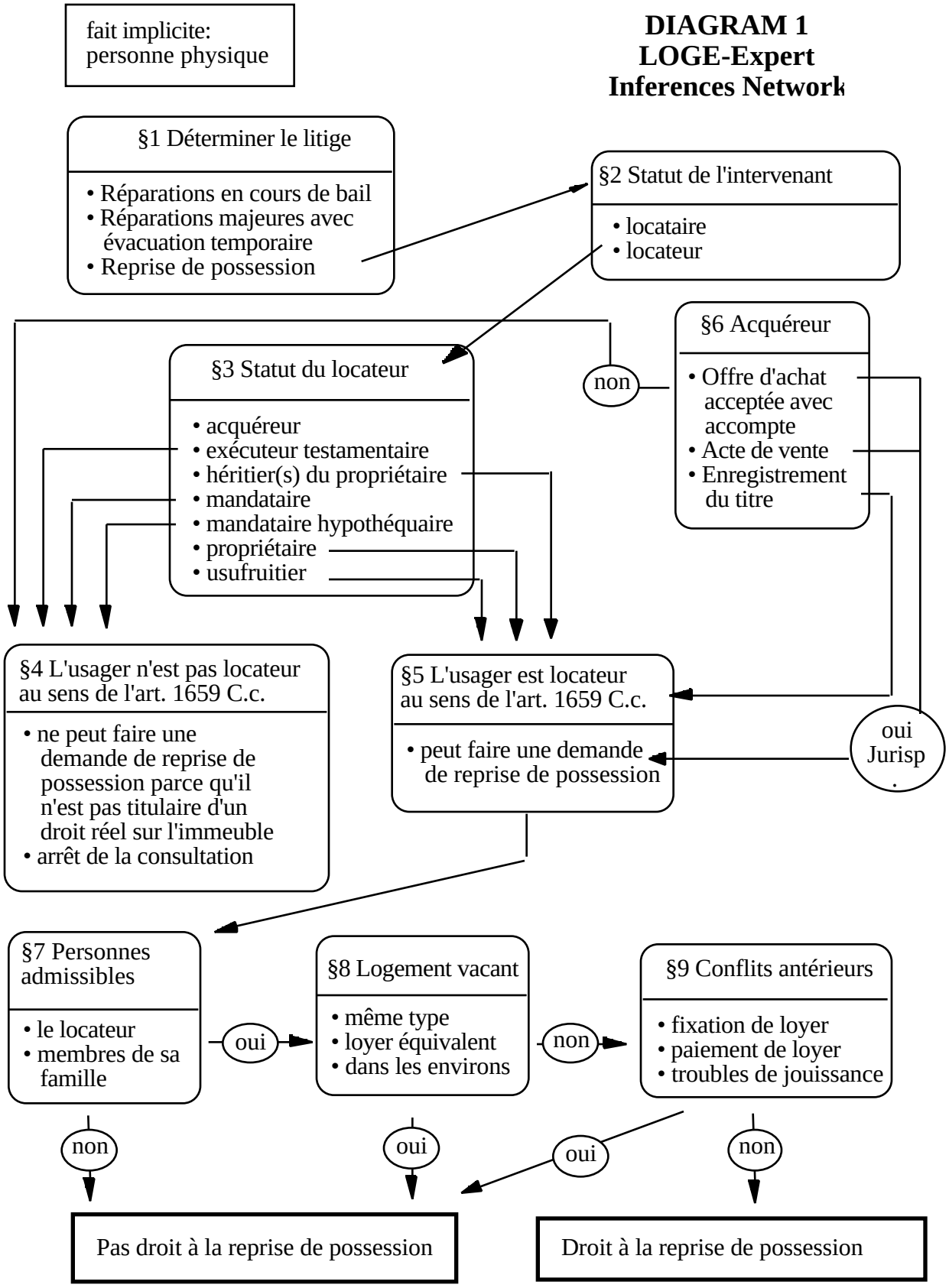
The hypothesis we are now testing is that the legal knowledge base is independent from the design of the man-machine interface. In accordance with this, we have built a legal knowledge base about repossession which integrates the knowledge of a legal expert according to two different structures: a dictionary-type structure and an inference rules structure. With the dictionary type structure, we have drawn the extended limits of our specific legal domain from the residential lease to the theory of obligations. We have formalized key concepts belonging to that extended legal domain (theory of obligations) from the dominant doctrine point of view. On the other hand we have looked at the specific concepts belonging to repossession, scrutinizing the Civil Code articles on repossession

and the pertinent tribunal decisions interpreting them. For some open texture concepts (purchaser) we have had to refer to doctrinal statements in order to explicitly state all the meanings they may have, depending upon who employs the concept. We have supported traits and values given to concepts (granules) by referring them to relevant Québec Civil Code articles and tribunal decisions, as well as to doctrinal works.

With the inference rules structure, we have adopted another strategy. We have simulated the way a legal expert will answer questions asked by a landlord who wants to know his rights with respect to repossession. We will use an equivalent pattern for a tenant's questions. In our future work, we plan to interview Housing Law experts to hear their solution to the same residential lease conflicts, in order to arrive at a better understanding of the legal reasoning which is followed by legal experts to reach a solution to a specific legal problem.

From our simulation, which will be tested later on, once we will have proceeded to the legal expert interviews, we have set out inference rules. These are built like a critical path which leads step by step from the initial question asked by the landlord to the final solution a legal expert would give.

That critical path is summarized in Diagram I which explains all the steps followed during the client-lawyer simulated consultation. We isolated nine steps from the landlord's initial question to the expert system's final answer (Thomasset, C., 1989).


fait implicite:
personne physique
DIAGRAM 1
LOGE-Expert
Inferences Network
§1 Déterminer le litige
• Réparations en cours de bail
• Réparations majeures avec évacuation temporaire
• Reprise de possession
§2 Statut de l'intervenant
• locataire
• locateur
§3 Statut du locateur
• acquéreur
• exécuteur testamentaire
• héritier(s) du propriétaire
• mandataire
• mandataire hypothéquaire
• propriétaire
• usufruitier
non
§6 Acquéreur
• Offre d'achat acceptée avec accompte
• Acte de vente
• Enregistrement du titre
§4 L'usager n'est pas locateur au sens de l'art. 1659 C.c.
• ne peut faire une demande de reprise de possession parce qu'il n'est pas titulaire d'un droit réel sur l'immeuble
• arrêt de la consultation
§5 L'usager est locateur au sens de l'art. 1659 C.c.
• peut faire une demande de reprise de possession
oui
Jurisp.
§7 Personnes admissibles
• le locateur
• membres de sa famille
oui
§8 Logement vacant
• même type
• loyer équivalent
• dans les environs
non
§9 Conflits antérieurs
• fixation de loyer
• paiement de loyer
• troubles de jouissance
non
oui
oui
non
Pas droit à la reprise de possession
Droit à la reprise de possession

This inference network illustrates the way we can modelize legal reasoning sequences included in a legal problem resolution process. At any time, during the construction of these two phases of our legal knowledge base, we were able to reformulate legal and non-legal concepts, as well as to add any new concepts needed to go further in the legal reasoning sequences. Such an occasion arose in modelizing the legal concept "Landlord". As no definition exists in the Québec Civil Code articles related to residential lease, we had to refer to tribunal decisions and to doctrinal works to give the concept some content. We found seven different meanings for the concept Landlord, but not all of them admit repossession. Among those which do not authorize a landlord to repossess rented premisses, the title "purchaser" is the most ambiguous. In our preliminary work, we did not succeeded investigating all the doctrine on the different meanings for which the concept "purchaser" could be considered as meaning "a landlord eligible for repossession". Nevertheless we have been able to add a granule, "purchaser", to the dictionary structure which has been assigned traits and values according to our research into relevant tribunal decisions. Much work is needed to finalize the complete inference scheme in regards to the repossession process from the landlord's point of view, and similar work should be done for the tenant's part. LOGE-EXPERT, in its final phases, should be able to deal with both sides requests.

The legal nucleus is totally autonomous from the communicational layers we have designed for non expert users. We will explain these in the following sections.

2.4 The communicational layers

Each concept included in the legal nucleus (the legal knowledge base) should be explicited to the user's request through the communicational layers. The legal nucleus is the center of legal reasoning, but elicitation of its components and of the meanings of legal concepts it manipulates should appear through communicational layers.

Our aim is to motivate the user to undertake his search for legal expertise without the requirement of any technological knowledge. The general population is not interested in learning how to use a computer to get access to legal expertise. People want to have access to legal expertise through automated tellers. We need to build an interface which should be on the same model as the automated tellers people use at the bank. This means that the communicational layers should be designed with the state of the art technics developed on "plain language" and readability of legal language (Ribordy, F.X., Laflamme, S., Cazebon, B., 1986-1987). It also means that simplicity will be a must in the writing of questions and answers, as well as in choices of wordings. It necessarily implies a standardization of vocabulary.

There are three main categories of interface (Rialle, V., 1988). The first is the commands language interface. We find it in the exploitation system (DOS). It offers fixed expressions which require a high abstraction capacity from the user. For example, the command: DIR A: which commands the computer to list all the files of the disk drivers identified by the letter A. Most of our users do not benefit from the necessary level of computer literacy.

The second one accepts natural language statements as commands. For example: 1) GIVE ME THE CONTENT OF THE EXTERNAL DISK DRIVE? 2).I WANT THE LIST OF ALL THE FILES OF THE DISK DRIVE A. The benefit of flexibility in the expression of the command is counterbalanced by some negative points. Until speech recognition is functional, it implies the use of a keyboard which is not necessarily attractive for people untrained in the use of typewriters or word processors. Furthermore, the use of natural language needs a set of programs which are incompatible with the size of the micro computer we are aiming at. Let's imagine the complexity of the task of having the computer understand that the wordings of examples 1 and 2 mean the same thing.

The last category is the iconic. This type of interface is based on the general open-system, user friendly in the Xerox philosophy. Being so, the dialogue is mainly menu-driven and the user input is generally entered via mouse-clicks (or other type of pointer) and simple form filling procedures. It is also characterized by a multi-window system. All the available commands are offered for the user to select by means of the pointer. The keyboard is seldom necessary.

Two main reasons justify our choice of an iconic interface. As the options are all listed in the menu, there are no alternative formulations on misspelling possibilities, nor prerequisite learning. By itself, an iconic interface is not sufficient to fulfill our goal of giving people autonomy in consulting LOGE-Expert. Each option to be selected should be documented by the concepts of the legal nucleus. To enable the greatest accessibility from expert to non-expert users, without interfering with the legal reasoning or with the speed of the answers, the independence of the legal nucleus from the communicational layers must be established.

But the iconic interface with documentation of the available options covers only one part of our needs: the questions asked by LOGE-Expert to get the facts of the problem from the user. The other part is the explanation in the user's language, of the consultation results, which are expressed in legal language. The explanation should fit with the communicational layers and with the independence from the legal nucleus. This could be done through formulation of messages included in the conclusions of the inference rules. To respect the independence mentioned above, other kind of rules of a communicational nature, could be added to the knowledge base. They should be clearly identified as such, and should take the communicational layers into account.

Finally, the printing of a brief report could be added to the iconic interface and the communicational rules. This report would summarize the legal consultation and the correlative explanation. It could

be a useful tool for the user to remember the consultation, to compare with the results of other expertise, to share the results with others, or to facilitate mediation.

3. Legal expert systems for non expert users legal and technological issues

We have learned from earlier developments in our paper that the necessity of being explicit in our choices about legal expert system users drove us to find technological solutions adapted to our aims.

In our final part, our reflections focus on issues we have encountered in the course of our work on LOGE-EXPERT. One such issue arises in the difficulty of matching human being, legal knowledge and computer. A second issue involves the macro and micro modelization of legal knowledge.

3.1 Matching human being, legal knowledge and computer

As we discussed in the second part of our paper, in LOGE-EXPERT we have designed communicational layers separated from the legal nucleus. A layman user could not generally understand the legal concepts as they are modelized in the knowledge base without getting some explanation as to their meanings. Communicational layers are supposed to facilitate the interface between a non-expert user and the legal nucleus. In order to succeed in matching human being, legal knowledge and computer, we have to take three distinct dimensions into account: the ergonomics of the expert system, the socio-cultural characteristics of the expert system users and the accessibility of the language adopted in building the communicational layers.

3.1.1. The ergonomics of expert system.

Expert system ergonomics are more developed in the case of industrial expert systems than with legal expert systems (De Terssac, G., 1988, Barthet, M.F., 1987). Very little has been done to understand the way laymen are confronted with computers to get legal knowledge. Much more research has to be directed towards adapting technology to human constraints. Instead of training people to adapt themselves to computer languages, we should find easier ways of helping people interact with knowledge modelized into computers. This research requires a multidisciplinary approach which includes psychology, information sciences, communication sciences, socio-linguistics, computer engineering as well as marketing. Furthermore, the success of such research depends partially on the social commitment of the research team.

Among the computer science research sectors, the one oriented towards the final user seems to be the most promising for our purposes: the adaptation of the technology to its user.

3.1.2. Socio-cultural characteristics of the expert system users.

Expert systems have improved much more on the side of software engineering than on the user's side. We know very little about the general public as expert system users. We need to understand the user's behavior when he looks for informations. We should pay attention to multiple human factors such as the user's profile, his cultural backgrounds, his level of expertise knowledge. In the context of LOGE-Expert, layman and the expert user are the opposite poles on a continuum which includes landlord and tenant associations as well as lawyers not expert in Housing Law. Prerequisites for the use of the expert system, such as training to run the system or to understand the wording of a given answer, should be finely tuned to the expectations of the user, since this could be a factor in the system's success as important as the consistency of the legal nucleus.
Data on users should be contextualized. For example, observations of lawyer-client interviews should be made in order to understand the way questions are asked and answers are given by both parties. Even if asking questions is the most common day-to-day human activity, the technical understanding of it, is limited (Kerpley, G.P., 1976). Our observations will thus help us to understand this process in the very specific situation of a legal domain. The mechanism which structures the formulation of questions should be fully understood because it provides an articulation for the legal knowledge modelization. Furthermore, special attention should be paid to strategies which, during the legal problem resolution process, discriminate among clients' answers to avoid bias and prejudiced informations.

3.1.3. The accessibility of language.

After having set up the chaining of the questions and explored the admissibility of answers from a layman's point of view, we should focus on the language used during the process (Ribordy, F., Laflamme, S., Cazebon, B., 1986-1987). Two aspects have to be covered: the lexicon and the wordings. For each legal concept, we will find one or more equivalent expressions understandable by laymen. This lexicon will have to be validated by both lawyers and laymen. The wordings of the definition of legal concepts should take into account the more recent research on readability. From a practical point of view, we will elaborate a set of rules on the length of words, the complexity of sentences in terms of propositions etc.., to design the wordings. This methodology will prevent us from arriving at ad hoc solutions and will enable us to distribute the task of designing the wordings among several members of the research team on one hand, and to spread it

over a long span of time on the other. Once the wordings are done, we will turn to their visual representation on the computer screen, because a screen window is a completely different information media from paper. We will take into account visual semiology analyses of the structure and the components of the messages and its representation. As we have opted for an iconic interface we should be attentive to the scientific developments in these aspects of communication between the computer and the user.

Our proposition for a solution to the recurrent problem of matching layman, legal knowledge and computer is to separate legal knowledge from the communicational layers. For each of them, we have selected a specific mode of intervention: knowledge engineering for the legal nucleus, ergonomics for the communicational layers.

3.2 Macro and micro modelization of legal knowledge

3.2.1.Macro-modelization.

As we stated in 2.1 above, we followed two different paths in LOGE-EXPERT to modelize our specific legal knowledge. When we tested D_Expert for the first time, we noticed that the technology of the expert system needed more legal knowledge than we expected to give an accurate answer to a request (Thomasset, C., 1988,1989). For example, we wanted to modelize the residential lease domain but in the knowledge base we needed to include all the basic concepts of the theory of obligations to simulate the reasoning of a legal expert. We called this process a "macro-modelization".

Legal reasoning in a specific legal domain requires more knowledge than the specific legal domain may contain. It seems that knowledge is organized into a hierarchy and thus reasoning at the lower stratum (residential lease) implies recourse to the upper stratum (theory of obligations). However, the expert system technology does not require a prior exhaustive description of the upper levels of legal knowledge before work with the lower ones can proceed. At any time in the process, key legal concepts may be add that appear to be relevant to constructing more specific ones. The design of D_Expert is particularly suited to this kind of cognitive operation and this was in fact our own experience. To modelize the specific knowledge on residential leases, we had to feed the legal knowledge base with the underlying key concepts from the theory of obligations in order to produce a satisfactory chain of inferences. This experiment leads us to state that legal knowledge engineering of a specific domain is not only the process of encoding and chaining its specific

concepts but also a process of elicitation of the fundamental knowledge and of the legal principles which activate them.

Most legal expert systems include a formalization of law in formal logic statements (Boston, 1987, Susskind, R.,1987). Formal logic gives us a rigorous framework which enables us to extract taxonomies, to build decision trees, to express procedures, etc. But formal logic, because it generally does not take into account the content of the objects it manipulates, is of little help in the knowledge elicitation process (Paquin, L.C., Dupuy, L. 1989). An interesting alternative is grounded in natural logic (Grize, J-B., 1982). In short, natural logic gives a special attention to socio-cultural elaboration of concepts. This process is called "schematization" (Borel, M.J., Grize, J-B., Mieville, D., 1983, pp.99-146). The natural logic range of operations is wider than that of formal logic. Besides deductive activities, natural logic takes into account the operations of description, definition and specification of concepts. Much more work has to be done to operationalize these proposals into a firm methodology.

3.2.2. Micro-modelization.

We have also experimented with a micro modelization of our specific legal domain. When we were working on repossession, we noticed the same requirement of more legal knowledge. But unlike the previous case, instead of looking for more fundamental concepts in a legal domain, we were defining legal concepts by extracting all their characteristics, and for each characteristic, the admissibility value. To illustrate the process, let us describe the particular meanings of the concept "landlord", in the context of repossession. As no definition exists in the Québec Civil Code articles related to residential lease, we had to refer to tribunal decisions and to doctrine to give the concept some content. We found seven different meanings for the concept "Landlord", but not all of them permit repossession. Among those which did not authorize a landlord to repossess rented premises, the term "purchaser" was the most ambiguous. We did not succeed, in our preliminary work to investigate all the doctrine on the different meanings for which the concept "purchaser" could be considered as signifying a landlord eligible for repossession. Nevertheless, we have been able to add a "purchaser" granule to the dictionary structure, one which has traits and values according to our research into pertinent tribunal decisions. Thus during the construction of the two phases of our legal knowledge base, the concept dictionary and inference rules base, the legal and non-legal concepts were constantly reformulated. As well, some new concepts needed to go further in the legal reasoning sequences were added.

Micro modelization of legal concepts means that legal concepts must be described with sufficient completeness (such as landlord). Each relevant characteristic they present should be made explicit

(such as purchaser), when needed by the inference chain. On one hand, the micro modelization consists of defining and revising valuated objects, and on the other, of linking one concept to another. Defining a concept is performed by adding the pertinent characteristics value to its denomination. Revising a concept may consist in adding or deleting characteristics, splitting a concept into sub-concepts, etc... We do not however have to modelize a concept if not so required by the inference rules. This principle keeps the knowledge base down to a manageable size. Inference rules link a general concept to a more specific one and vice-versa, as well as linking requirements to specific states. For example, a "person" status is to be a landlord, and a "landlord" status is to be a "purchaser". A purchaser who has registered his ownership titles is a landlord eligible for repossession. We can always complete the dictionary structure in order to elaborate new inference rules.

Conclusion

To the extent our goals are clearly expressed, we are in a position to conclude that the why and the who do influence the way we build legal expert systems. Legal engineering is less influenced by the expert system specific user than the task it has to simulate. The legal concepts dictionary tends to be generally stable whatever the task expressed in terms of inference rules. The LOGE-Expert I dictionary has been re-used for LOGE-Expert II. A viable Legal expert system for non-expert user could be developed to the extent that certain conditions are followed.

In designing the expert system we should keep in mind the separation between the legal nucleus and the communicational layers; documentation and messages included in the communicational layers, should be written in a language accessible to the general population. The legal concepts should be clearly and adequately explained in the user's words without being occulted. Ergonomics concerns should prevail over other considerations for the design of the user-expert system interface.

References

BARTHET, M.F., *Ergonomie du logiciel*, Paris, Dunop, 1987.

BOLOGNA,(1989), *PROCEEDINGS of the International Conference on Law and Artificial Intelligence: Expert Systems in Law*. Bologna, May 3-5 1989, CIRFID, The Center for Law and Computer Science.

BOSTON (1987), *PROCEEDINGS of the first International Conference on Artificial Intelligence and Law*, Boston, The Center for law and Computer Science, Northeastern University, 1987.

BENCH-CAPON, T. J. M. AND AL. "Logic Programming for Large Scale Applications in Law: A Formalisation of Supplementary Benefit Legislation" in: Northeastern University. Center for Law and Computer science; ACM SIGART. *The First International Conference on Artificial Intelligence and Law Proceedings* May 27-29,1987; Boston, Mass. New York, p.190-198.

GARDNER, Van der Lieth, A., *An Artificial Intelligence Approach to Legal Reasoning*. Cambridge, Mass.: The M.I.T. Press,1987, 225p.
GRIZE, J.-B., " La recherche en logique naturelle", in: *Travaux du Centre de recherches sémiologiques*, n° 43, 1982, pp.73-78.
HAFNER, C. D. "Conceptual Organization of Case Law Knowledge Bases". in: Northeastern University. Center for Law and Computer science; ACM SIGART. *The First International Conference on Artificial Intelligence and Law Proceedings* , May 27-29,1987; Boston, Mass. New York, p.35-42.
KEARSLEY, G.P., "Questions and Question-asking in Verbal Discourse: across Disciplinary Review", in *Journal of psycholinguistics Research*, 5(4), 1987, pp.355-375.
MARTINELLI, R., "Un 'expert system' in materia di equo canone". in: *Atti del 3zo. Congresso internazionale organizzato dalla Corte di cassozione italiana* sul tema:'l'informatica giuridica e la comunita nazionale e internazionale' Roma, Maggio 1983, sess. VII No 8, p. 9.
MARTINO, A. A., SOCCI NATALI, F. . *Automated Analysis of Legal Texts: Logic, Informatics, Law*. Edited version of selected papers from the Second International Conference on "Logic, Informatics, Law", Florence,Italy, Sept.1985. North Holland, 1986.
MARTINO, A. A. " Legal Models, Rationality, Informatics". in: *Automated Analysis of Legal Texts: Logics, Informatics, Law.* A.A. Martino, F.Socci Natali, (eds), Elsvier Science Publishers,B.V. (North Holland), 1986, pp. 269-280.
MARTINO, A. A. "Les systemes experts juridiques".in: *Informatique et droit*: 20 ans d'expérience. Congrès international organisé par l'ADIJ. Strasbourg, octobre 1987 . 53p.
McCARTY, L.T. "Reflections on TAXMAN: An Experiment in Artificial Intelligence and Legal Reasoning". *Harvard Law Review* 1977, 90, pp. 837-893.
McCARTY, L.T., "A Language for Legal Discourse: 1. Basic Features", in *Proceedings of the Second International Conference on Artificial Intelligence and Law*, June 13-16 1989, The University of British Columbia, Vancouver, B.C. Canada, The Center for Law and Computer Science, Northeastern University, Boston, M.A., p.p.180-189.
O'NEIL, D. PETER "A process specification of Expert Lawyer Reasoning" in *Proceedings of the First International Conference on Artificial Intelligence and Law*, Boston, The Center for law and Computer Science, Northeastern University, 1987, pp. 52-60.
PAQUIN, L.C. (1987a) "DÉRÉDEC-EXPERT, environnement informatique pour la génération de systèmes experts"; présentation primée au *7èmes Journées Internationales 'Les systèmes experts et leurs applications'*; vol. 1, Paris, EC2: 61-78.
PAQUIN, L.C. (1987b) "DÉRÉDEC-EXPERT, outil d'ingénierie cognitive"; *Proceedings International Congress on Terminology and knowledge Engineering*, Trier (RFA), Frankfurt/M, INDEKS Verlag: 107-110. 1987.
PAQUIN, L.C., DUPUY, L. (1989) "An approach to Expertise Transfer: Computer-Assisted Text Analysis" *Advances in Computing and the Humanities* (to be published).
PARRET, H. "Au delà de la rhétorique du juridique: justififer par l'éthique, légitimer par l'esthétique". in: *Droit et Société, Revue internationale de théorie du droit et de sociologie juridique*, n°8, 1988, pp. 73-84.
RIALLE, V. "Ergonomie cognitive et bases de connaissances". in: *Le Journal de l'Intelligence Artificielle*, 1988, n° 9, Novembre 1988, pp. 4-9.
RIBORDY, F. ,LAFLAMME, S., CAZEBON, B. "Les textes de lois sont-ils lisibles et compréhensibles?" *Revue de l'Institut de sociologie*, 1986-1987, n°1, vol.2 ,pp. 223-244.
RICKS, Y. "Responsible Computers" Paper presented at the International Conference on "Intelligence and Society", International Social Science Council, European Coordination Centre for Research and Documentation in Social Sciences, Vienna, March 1988, to be published by Reidel (Netherlands).
RISSLAND, E. L. ASHLEY, K. D. "A Case-based System for Trade Secrets Law". in: Northeastern University. Center for Law and Computer science; ACM SIGART. *The First International Conference on Artificial Intelligence and Law Proceedings* , May 27-29,1987; Boston, Mass. New York, p. 60-66.

SERGOT, M. J. *Representing Legislation as Logic Programs: Technical Report.* London: Department of Computing, Imperial College of Science and Technology. 1985.
SMITH, J.C. , DEEDMAN, G. S., "The application of expert system technology to case-based law". in: Northeastern University. Center for Law and Computer science; ACM SIGART. *The First International Conference on Artificial Intelligence and Law Proceedings* , May 27-29,1987; Boston, Mass. New York, p. 84-93; x, 257p.
SPROWL, J. A. " An Expert System for Drafting Legal Documents". in: *National Computer Conference Proceedings;* 1984; 53: p.667-673.
STAMPER, R. "A Non-Classical Logic for Based on the Structure of Behaviour". In: *Automated Analysis of Legal Texts: Logics, Informatics, Law.* A.A. Martino, F.Socci Natali, (eds), Elsvier Science Publishers,B.V. (North Holland), 1986, pp.115-139.
STOCKINGER, P. "Possibilités d'une représentation conceptuelle de la situation normative". *Droit et Société, Revue internationale de théorie du droit et de sociologie juridique,* n°8, 1988, pp. 30-41.
SUSSKIND, R., *Expert Systems in Law: A Jurisprudential Inquiry.* Oxford: Clarendon Press, 1987.
SUSSKIND, R., "The Latent Damage System: A Jurisprudential Analysis".in: *PROCEEDINGS of the Second International Conference on Artificial Intelligence and Law,* The Center for Law and Computer Science, Northeastern University, Boston,MA, and the Faculty of Law, the University of British Columbia, June 13-16, 1989, pp.23-32.
TERSSAC,G.de, SOUBIE, J.-L., NEVEU, J.P., " Technologie et organisation: les savoirs menacés?", in *Sociologie du Travail*, 1988,n°3, pp.462-477.
THOMASSET, C. (1987a)." Le logement entre l'État et l'entreprise: génèse d'un droit en devenir". in: R.D. Bureau et P. Mackay (eds.). *Le droit dans tous ses états.* Montréal: Wilson et Lafleur, pp. 245-270.
THOMASSET, C. (1987b). *La Régie du logement à découvert*. Verdun, Louise Courteau, éditrice, 1987, 285p.
THOMASSET, C., BLANCHARD, F., HEBERT, R., (1988) "L'informatisation du savoir juridique: conception d'un prototype de système expert en droit du logement", in: *Recueil des activités du CIEST 1987-1988,* publié sous la direction de A.Caron et A.Michaud, Montréal, UQAM, 1988, pp.301-314.
THOMASSET, C., HÉBERT, R. (1988). " La démocratisation du savoir juridique par son informatisation, virtualités, contraintes, effets". in: *Une démocratie technologique?* .R. Laperrière, H. Claret, P. Péladeau, (eds) ACFAS-GRID, Montréal, 1988, pp.343-358.
THOMASSET, C. "Expert System and Legal Formalization: Evaluation of a prototype in Québec Housing Law". Paper presented at the International Conference on "Intelligence and Society", International Social Science Council, European Coordination Centre for Research and Documentation in Social Sciences, Vienna, March 1988, to be published by Reidel (Netherlands).
THOMASSET, C., " Expert System in Québec Housing Law: from HOME-Expert I to HOME-Expert II", paper presented at the International Conference on Law and Artificial Intelligence: Expert Systems in Law. CIRFID, Bologna, May 3-5, 1989, 29p.
VAMOS, T. "A.I. as a Vehicle for a More Advanced Democracy", Paper presented at the International Conference on "Intelligence and Society", International Social Science Council, European Coordination Centre for Research and Documentation in Social Sciences, Vienna, March 1988, to be published by Reidel (Netherlands).
VANCOUVER (1989), *PROCEEDINGS of the Second International Conference on Artificial Intelligence and Law*, The Center for Law and Computer Science, Northeastern University, Boston,MA, and the Faculty of Law, the University of British Columbia, June 13-16, 1989, 258p.