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NEW DIRECTIONS IN LEGAL INFORMATION PROCESSING

by

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1. Automated question-answering systems to provide quick and inexpensive answers to many non-controversial, but not necessarily simple legal questions to aid lawyers, social and welfare workers, administrators, police, and the public itself.
2. Automated consistancy-checking, and consequence-finding systems to aid in codifications and law reforms for legislative and administrative bodies.
3. Automated systems to assist in teaching law and legal reasoning for those who need to know the law, and
4. Automated interviewing systems for initial client and witness screening.

Also included in the paper are: a brief survey of recent applications of computers to the law, a discussion of the types of automation that are presently needed, and an outline of current developments in artificial intelligence which could be applied to aid in the automation of the law.

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NEW DIRECTIONS IN LEGAL INFORMATION PROCESSING

INTRODUCTION

Present areas of application of computers to the law fall into three broad categories: 1) those involving applications of business accounting techniques such as in tax preparation and client billing, 2) those involving data management techniques such as law enforcement, criminal justice, and keyword legal source material information systems, and 3) those involving on-line file manipulation in such areas as text-editing and drafting. These systems demonstrate that computers can work very well with problems that can be expressed in terms of numbers or information that can be handled on the basis of its external form.

During the coming decade, we foresee the continued expansion of the use of existing systems and also the development of some new systems based on conventional data processing techniques. Such new systems may be expected in automating the accession to index systems patterned on existing manual systems, processing land use documents, supervising paroled offenders, etc. However, ordinary data processing methods are by their very nature incapable of providing much-needed assistance in the central area of legal work, where the content of the material at hand (laws, contracts, depositions, etc.) must be understood and analyzed in terms of its meaning and logical relationships.

It is impossible, using file management techniques to deal with, for example, a set of conflicting laws or regulations. Problems such as these must be attacked at a level where the interrelationships among the various words and phrases (as well as their individual meanings) are understood.

Comprehensive machine-readable data bases of legal materials are rapidly becoming available as a result of the economies they afford in such areas as typesetting and legislative drafting. However, the conversion of legal materials to machine-readable form has not made them significantly more accessible to those who must use them. Because of the great complexity and volume of legal materials their analysis now requires great investment of time by highly trained personnel. If computers could "understand" legal materials, their attractive assets (their large reliable memory, and their extraordinary capacity for rapid and accurate information processing) would make them ideal assistants in the field of law.

The ability to provide such an understanding is emerging in new techniques currently being developed in a computer area called "artificial intelligence" in dealing with such problems as automated logical deduction, problem solving, and natural language understanding. These techniques appear to be the key to solving many of the problems of legal automation.

In particular, we foresee the development of a number of computer based services in this new technology. These include:

1. Automated questions-answering systems to provide quick and inexpensive answers to many non-controversial, but not necessarily simple legal questions to aid lawyers, social and welfare workers, administrators, police, and of course the public itself.

2. Automated consistency-checking, and consequence-finding systems to aid in codification and law reform for legislative and administrative bodies.

3. Automated systems to assist in teaching law and legal reasoning for those who need to know the law, and

4. Automated interviewing systems for initial client and witness screening.

In this paper we include a brief survey of recent applications of computers to the law, a discussion of the further types of automation that are needed in the law, an outline of current developments in artificial intelligence which could be applied to aid in the automation of the law, and finally a description of the new directions we envision for legal information processing during the 1970's.

A SURVEY OF RECENT APPLICATIONS OF COMPUTERS TO THE LAW

Automation has been applied to problems in criminal justice and law enforcement as well as a host of other applications including legal information retrieval, income tax preparation, and legislative drafting systems. In this section a brief description of these application areas is given. For a more thorough survey of this work see Robins [47]; the May, 1971 issue of Law Library Journal, which is devoted to computers and law; and the individual references cited in this paper.

Criminal Justice and Law Enforcement Information Systems

For our purposes, we can view criminal justice and law enforcement information systems as consisting of users, a computer, and an ever changing data base being used to collect, store, and update information in such a way so as to facilitate the retrieval and exchange of criminal justice and law enforcement information for governmental units. The most

advanced of these systems include: Project SEARCH [61](System for Electronic Analysis and Retrieval of Criminal Histories) developed jointly by LEAA (Law Enforcement Assistance Administration) of the Justice Department and a number of participating states, the NCIC [19,23] (National Criminal Information Center) computer network of the Federal Bureau of Investigation, and the NYSIIS [22] (New York State Identification and Intelligence System).

Legal Information Retrieval Systems

The volume of jurisprudential reference material in the form of cases, statutes, and administrative rulings and regulations has prompted the development of automated law retrieval systems to aid the legal researcher. This work has been based in part upon research being carried out in the area of library automation and is specifically related to the problem of document retrieval.

Of the experimental projects that have been undertaken for performing automated legal information retrieval the basic assumptions have been that a person seeking technical legal information can be led to relevant information using a keyword type approach, and that technical legal information can be categorized in such a fashion as to be retrieved by a keyword type approach. Within this framework there are basically two approaches that have been taken: those systems which rely on prior manual abstracting of library material and those which operate on full natural text without abstracting.

Systems Requiring Manual Abstracting

The first system for computer storage and retrieval of legal material developed by Morgan [42,58] was used for the retrieval of case law. It

employed an approach where concepts were identified and assigned code numbers which were in turn linked back to the original case. Thus, having once determined the relevant concepts one could retrieve the citations to pertinent cases. This approach was very similar to the manual indices that have widespread use today such as the West Key Number System. Other attempts at automated legal research using this approach have been made by the Federal Trade Commission [2], and the Antitrust Division of the Department of Justice [47].

Systems Operating on Full Natural Text

A significant departure from the manual abstracting approach is the Key Word in Combination approach of John Horty [28,29,31]. Here, no abstracting or indexing of the material was done manually. Retrieval was done by finding combinations of keywords in the original text. A researcher could specify lists of words that must appear in the same sentence or statute as well as the desired word ordering. The LITE (Legal Information Through Electronics) Project developed by the Air Force Accounting and Finance Center [37] and the Root Index System developed by the Southwestern Legal Foundation [43,49,56] are two other systems that are similar in design with the Key Word in Combination approach. The OBAR System developed by the Ohio Bar Association [45] and Mead Data Central has added significant on-line interactive capabilities to this type of approach.

The ABF-IBM Project

The ABF-IBM (American Bar Foundation and International Business Machines) Project [15-18, attempted to overcome the disadvantages of either of the other previous approaches by automatically generating frequencies for

each word used in the original case. Deviations or "skewness" of certain words from a normal distribution were assumed to convey information about the contents of the case.

Other Applications of Computers to the Law

There are many other applications within the legal area for which automation has been proposed, and in some cases even implemented [6,34,35,39]. Most of this work represents straightforward applications of current technology to the particular problems encountered in the legal area using methodology well established in other areas, such as office management and business accounting. Automated legislative drafting and revision, will drafting, as well as general law office document drafting are good examples of the extension of available hardware and software that has been made available in recent years. Automated court management, legislative reapportionment, law office management, income tax preparation, land title recording, and estate planning are examples of established data processing techniques that have been used for legal problems.

THE NEED FOR NEW DIRECTIONS

The quantity and complexity of legal materials is increasing at a rate that cannot be adequately handled by traditional means. In many areas the growing demands of modern society have been met by automation. However, modern computer techniques have had only a minor effect on the three major areas of legal work where they might seem applicable: legal research, legislation, and legal education. As mentioned above numerous attempts have been made to apply scientific and business data processing techniques to such legal problems, but all have fallen short of major impact because they have

been by their nature unable to deal with the verbal and logical complexities of the law.

Most areas of legal work have remained relatively untouched by automation. The problem is not that the legal profession has neglected automation; rather it is that technology has failed to meet the demands of the law. What is lacking is the capacity to give legal personnel the same sort of assistance in their routine work with words and concepts that engineers get from the computer in their routine work with numbers and formulas. What is needed is the automation of the process involved in routine legal reasoning and research.

Modern statutes and administrative regulations are of such immense complexity as to be impossible to understand for the layman and difficult even for the lawyer. The problem is particularly acute in many areas where the task of interpreting and enforcing the law has traditionally been left to non-lawyers, for instance, welfare administration.

To give an example of the problem: At present when local administrative authorities receive an application for welfare benefits, the eligibility of the applicant and the benefits to which he is entitled are determined by a large and conflicting body of local, state, and federal welfare laws and regulations which may total hundreds, if not thousands, of pages in length. Typically an applicant may have to wait for weeks or even months while an overburdened administrator attempts to determine his legal status. As another example, a business transaction involving questions of tax laws, zoning regulations, and building codes may fall through because of the delays and expense involved in the drafting of the transaction to conform to the many, and possibly conflicting, requirements of the law.

The successful development of automated techniques for dealing with complex legal situations would help in these and many other areas by providing quick and inexpensive answers to many routine legal questions. Such techniques could also help employers and employees determine their rights under labor relations contracts. They could help both the taxpayer and the government in tax planning and administration. It would even be possible to provide legal guidance for some small businessman's transactions which involve too little money to justify full scale analysis by a lawyer.

In many areas, where the law now consists of confusing and conflicting regulations at different levels--federal, state, and local, the first step toward law reform would be the unscrambling of a situation that has been caused by years of haphazard legislation so as to provide a clearer assignment of rights, duties, and administrative responsibilities. However, legislators have been unable to take even this first step, not merely because of the cost, but also because human ability to enact complex legislation appears to exceed human ability to reorganize, recodify and simplify that legislation.

The total length of the United States Code and the collected statutes of the various states has doubled in the past few years and promises to double again in this decade. In commercially important areas such as tax law, it is possible, at high cost, to find specialists who understand even the present incredibly complex legal picture. In many socially important areas, such as welfare law, pollution control law, environmental quality law, and urban planning law, it is almost impossible to find anyone who has a thorough working knowledge of the field. As a result, many important social programs are either slowed down or stifled.

To illustrate the complexity of the problems involved consider a single section of federal welfare legislation, for instance, that dealing with state plans for aid to needy families with children (42 U.S.C. §602). This single section refers to eight other sections, most of which in turn refer to still other sections creating an incredibly complex network (as illustrated in Figure 1). Even one of the shortest sections referred to by §602, namely §625, which defines "child welfare service" has an extraordinarily complicated internal logical structure (as illustrated in Figure 2).

There is a major unfilled demand for legal services in the United States. It is particularly acute for lower income groups, but legal services, like other unautomated services, are increasingly becoming priced out of the reach of larger and larger segments of the American public. At present large law firms provide excellent legal services for those able to pay their fees. Most of the lawyers in these firms spend most of their time in legal research and drafting legal documents [55]. The small businessman or average citizen, if he can afford legal service at all, typically employs a sole practitioner who cannot afford the library or the time necessary to do an adequate job of legal research on his client's problems [11]

The experience of the medical profession in dealing with the problem of the cost of doctors' services suggests that two approaches be tried simultaneously. First, the rapid automation of those areas suitable for automation, and second the training of paraprofessionals to free the professional from routine tasks. However, the training of paraprofessionals in law--welfare administrators, social workers, lay magistrates, law clerks, etc. has been neglected by American

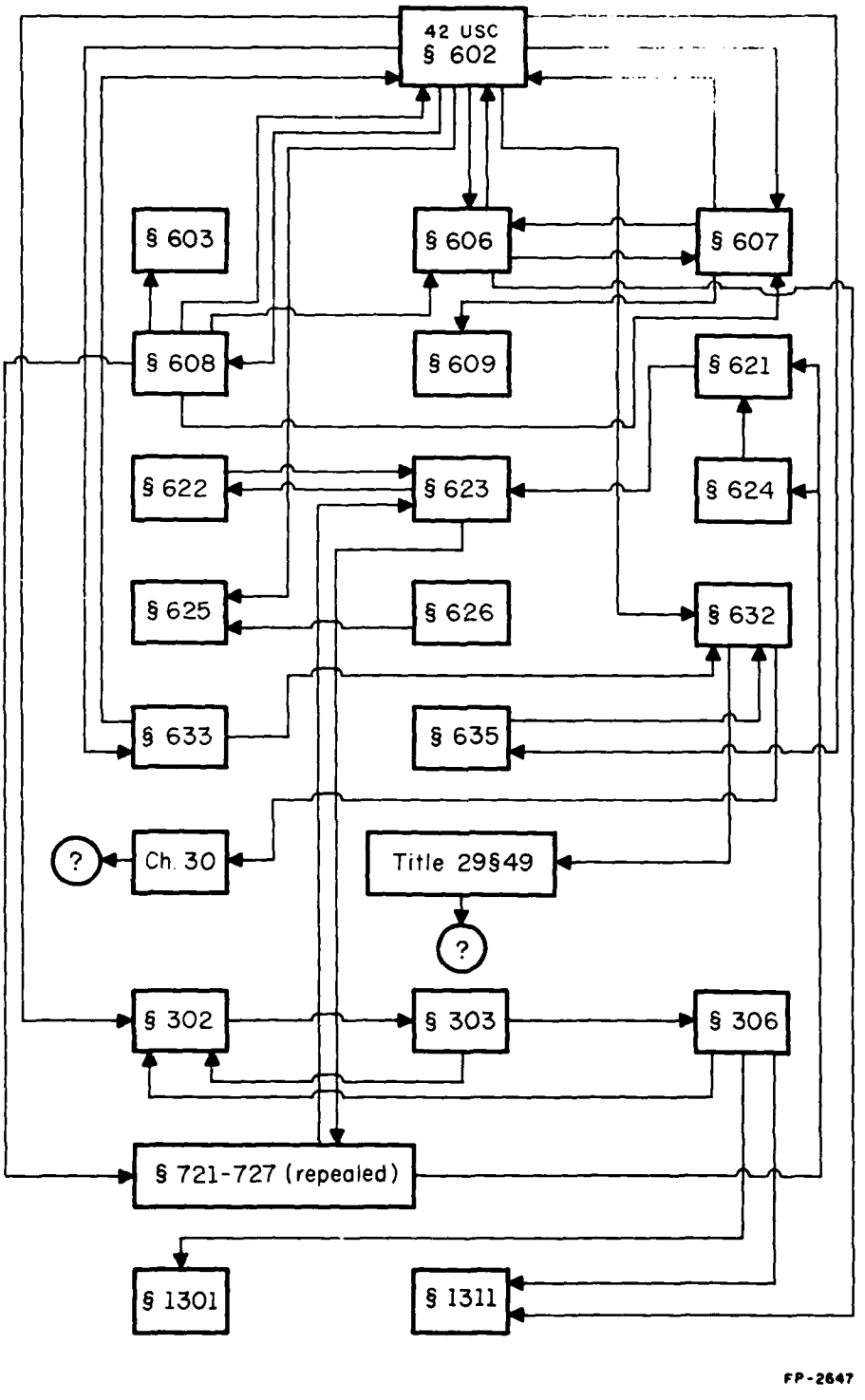

Figure 1. Network of References from 42 U.S.C. §602, "State Plans for Aid and Services to Needy Families with Children." References to the laws of the fifty states, implicit cross references, and references to federal and state administrative and judicial interpretation of the statute have been omitted for lack of space.

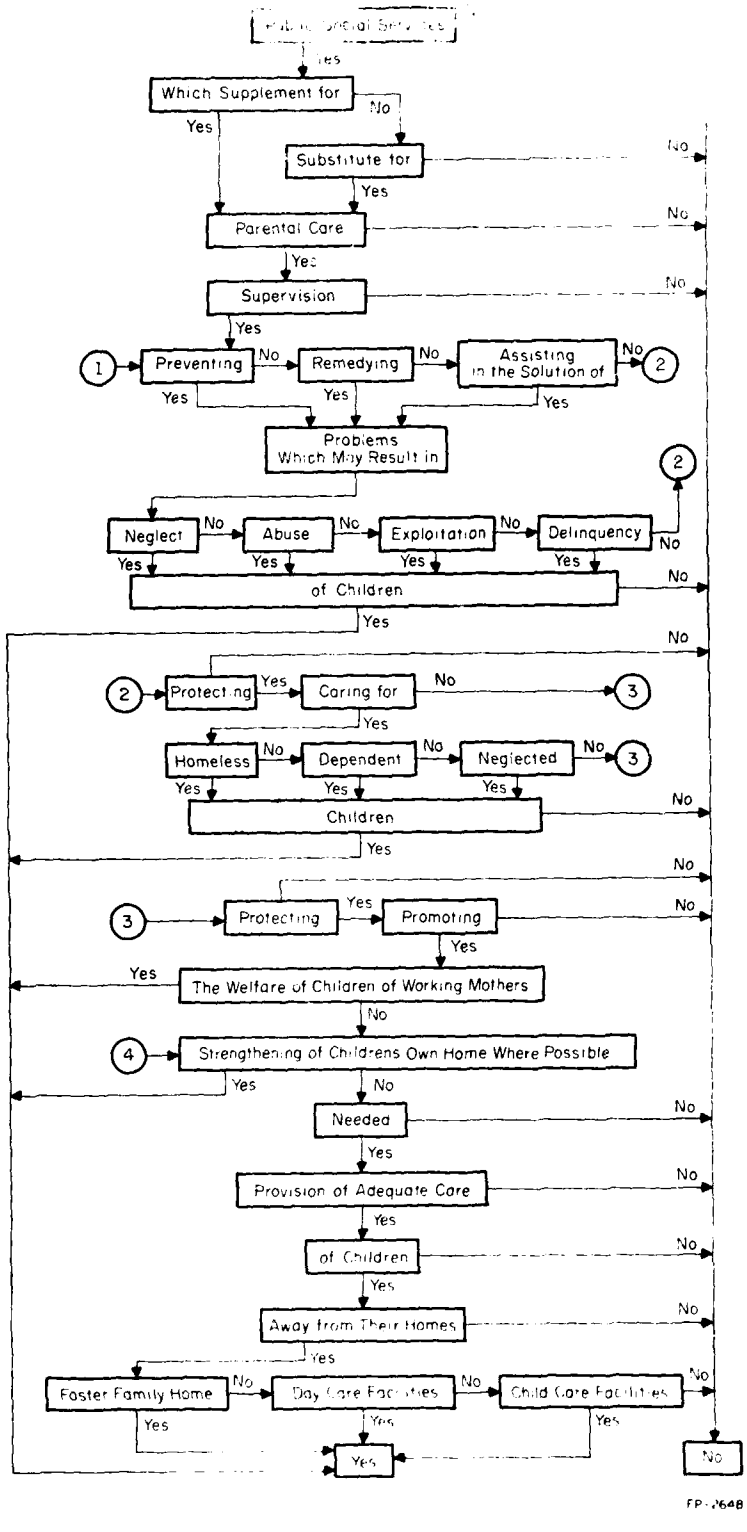

Figure 2. Logical structure of 42 U.S.C. §625 "'Child-Welfare Services' Defined." One of the simpler sections. Appendix A contains the text of this section.

education. Application of traditional methods of legal education to the problem would be possible, but it would be expensive, and would be difficult in view of the fact that all American law schools are filled to capacity [5].

RECENT DEVELOPMENTS IN ARTIFICIAL INTELLIGENCE APPLICABLE TO LEGAL AUTOMATION

A significantly broad theoretical framework has been established for the application of computers to the law as the result of research and development in the area of artificial intelligence, in particular in question-answering systems where work has been carried on for over a decade. For information concerning such systems we refer the reader to Simmons [52,53]. Of the more advanced question-answering systems Green and Raphael [24,25] have developed a very powerful deductive procedure, and Simmons, Burger, and Schwarcz [51,54] introduced an extremely attractive representation scheme, while Biss, Chien and Stahl [7,8] have developed the R2 system which incorporates a number of advanced features not found in these other systems. These systems have attacked the problem of understanding facts and answering questions about them on an automatic basis. It is understood as a result of the development of these systems, how to, for example, resolve certain kinds of semantic and syntactic ambiguities. In addition, a number of sophisticated formal internal structures have been developed that allow much of the expressiveness found in natural English and yet can be manipulated by machines in a systematic fashion.

Transformation of Natural English into a Formal Internal Representation

Generally, natural language question-answering systems use some formal internal representation for information in order to facilitate deductive manipulations. In a number of earlier systems the representation was based upon some

type of limited relational calculi, as for example Raphael's SIR [46], and Black's SQA [9]. Green and Raphael [24,25] subsequently developed a system that offered the full expressiveness of the first-order predicate calculus for the representation of natural language information. Simmons, Burger, and Schwarcz [51,54] developed a system that used nested binary relations for the formal representation of natural language information. The R2 question-answering system developed by Biss, Chien, and Stahl [7,8] uses a high-order formal language for the internal representation of information. This system represents relations between relations and quantification of variables ranging over rather complex structures. The data base chosen to demonstrate the capabilities of this system is an informal description of the motor vechicle laws of Illinois.

Logical Deduction as Performed by Computers

What types of "reasoning" or logical operations can be performed by a computer upon factual information expressed in a formal language? There has been significant progress in recent years in the research of deductive reasoning as performed by computers. Nevertheless the computer's ability to reason with formal concepts such as those as found in legal materials is still far from fully realized.

Automated deduction procedures have been developed for the propositional calculus, but the limitations of this calculus for most practical applications led to the search for automated procedures for the first-order predicate calculus. For the first-order predicate calculus, an effective deduction procedure based upon an automatic theorem-proving algorithm was first described by Robinson [48] and was improved upon by Wos, et al. [62,65]

and others [3,4,33]. Currently work is being done by a number of researchers to find effective procedures for high-order logic where concepts that cannot be handled adequately in the first-order logic can be accommodated.

NEW DIRECTIONS

The use of computers as an aid to the legal process is already extensive as indicated by the work described above. There is, however, a vast difference between providing automated criminal justice and law enforcement information systems or legal information retrieval systems on the one hand, and improving the availability and quality of legal services on the other hand. In the first case the computer is used to accomplish well-defined but time-consuming routine tasks; the second case has been almost completely ignored with respect to the cognitive potential that computers can provide. Research in this country in this second area is virtually non-existent.

We envision the initiation of research programs within the near future to meet the need for automation in the law with the following objectives: first, to increase the ability of lawyers, administrators and the public to deal effectively with many of their legal problems; second, to aid legislative and administrative agencies in the reform and development of legislation and regulations concerning current social problems; third, to provide legal training on an automated basis for lawyers, social workers, police, and others who need to know the law for the performance of their duties; and fourth to automate client and witness interviewing and screening.

As outlined above, the theoretical framework for such research must be drawn from the field of artificial intelligence and in particular from current

investigations in automated natural language question-answering and logical deduction. Eventually the development of automated inductive logic may also offer significant aid in legal work. For an excellent discussion of this possibility see [10]. Numerous data bases of machine-readable legal materials already exist. The specific tasks that must be accomplished are:

1. The development of techniques for the transformation of natural language legal information into formal internal representations.

2. The development of techniques for automated logical deduction from legal materials in formal internal representations.

3. The development of practical automated legal question-answering systems based upon these logical deduction techniques.

4. The development of systems for machine assisted consistency-checking and consequence-finding to aid in the normalization, integration, and modification of legislation and administrative regulations.

5. The development of computer based legal education systems based upon the automation of the traditional Socratic method of legal instruction, using dynamic question-generating techniques rather than preprogrammed instruction; and

6. The development of conversational computer techniques for obtaining information from clients and witnesses.

The Data Base

A large quantity of federal and state legislation has already been converted to machine-readable form, and in a number of jurisdictions new legislation is being recorded initially in machine-readable form. The availability of legislation in this form has led to significant economies in the process of inserting amendments both at the original enactment of a statute and as a result of later legislative action, and has helped in the development of keyword

document retrieval schemes. The Illinois Legislative Reference Bureau, for instance, has an advanced on-line system developed by Data Retrieval Corporation, with a dozen terminals for use in legislative drafting, law revision and keyword retrieval. While these techniques are not in the central area of legal work, their existence, and the benefits and economies they provide, guarantee the availability of data bases in machine readable form.

Existing machine-readable materials include all types of primary legal sources. These are: comprehensive codes such as the Uniform Commerical Code and the Internal Revenue Code; uncodified legislation such as state statute collections; and judicial and administrative decisions.

Selection of Relevant Materials From the Data Base

The selection of relevant materials from the data base may be based on a combination of four methods. The keyword method, despite the shortcomings which have prevented its widespread adoption in legal research, is very efficient for certain types of questions. The automation of the present manual system involving networks of case and statutory citations would present few technical problems [36]. The automation of the current system of abstracts and digests combined with new techniques of automated abstracting might save the current system from the strain of the legal information explosion. Finally, as computer time becomes cheaper and cheaper, the artificial intelligence techniques discussed below (which might be expected to bring significantly better results but to use substantially more computer time) might supplant the other methods.

Transformation of Legal English into a Formal Internal Representation

Lawyers have already developed a highly formalized language as a means of communication. Development of effective legal information systems will require investigation of the problems associated with transforming this subset of natural English into an internal representation suitable for use in legal question-answering, consistency-checking, consequence-finding, and instruction systems. This research can draw upon recent advances in automated syntactic and semantic analysis, e.g., [7,50,59].

Logical Deduction

In order to automate the processes involved in legal reasoning an analysis of the logical structure of legal information is necessary. Knowledge of this structure will aid in the selection and development of effective automated legal reasoning techniques based upon theorem-proving techniques mentioned above. Within the framework provided by automated theorem-proving techniques it is necessary to find reasonable models for deductive legal reasoning. These procedures can be incorporated in the legal question-answering, consistency-checking, consequence-finding, and instruction systems described in the next few paragraphs.

Legal Question-Answering

Interactive legal question-answering systems with internal representation and logical deduction techniques adapted from prior research on general natural language question-answering systems to reflect the nature of legal materials should be developed, for only natural language question-answering systems allow the user to engage a machine in a meaningful dialogue in order to specify his

needs and receive appropriate responses. Since almost no legal personnel have any knowledge of computer programming, communications between the user and the machine should be performed entirely in the natural language question-answering mode in English.

Consistency-Checking and Consequence-Finding

In addition to the question-answering function of the future systems, the ability to find relevant consequences for given sets of facts with respect to specified rules, regulations, laws, statutes, contracts, etc., should be incorporated. They should be capable of determining the relative consistency of any body of legal information. At present these functions, as carried out by lawyers on a manual basis, are very time consuming and are subject to error.

These systems when completed will involve direct benefits for legislators and administrative rule-makers. They will be able to use their capabilities to help in the detection and elimination of contradictions and ambiguities in existing law. Legislators will also be able to examine more fully the implications of proposed additions to the existing body of legislations.

Automated Legal Instruction

Legal instruction now takes many forms [5]. Some of the methods which are and will be most important in the future lend themselves to automation using artificial intelligence techniques. These include basic instruction in legal doctrine and method designed to give the student basic skills in legal vocabulary and reasoning; [5, pp. 17-18], extensive instruction designed to expose the student to surveys of broad areas of the law [5, pp. 21-22], and simulated

clinical instruction designed to develop practical skills and awareness [5, pp. 41-42].

The accepted method of teaching basic skills in legal vocabulary and reasoning in the United States has long involved the asking of specific questions and their answering by the students as a major if not the major component of the instructional process. However, because this procedure is effective only when applied by highly qualified instructors to relatively small groups, it has been expensive to use in law schools and it has found comparatively little use in programs of legal education for non-lawyers. An authoritative recent study places the cost per legal instructor in programs for non-lawyers at $55,000, a large figure,even though less than the $80,000 a year cost for each professor in regular law school instruction [5, pp. 69]. It is hoped that the automation of this process will reduce its cost and extend its availability.

A legal question-answering system may be modified to form a system where questions are generated automatically to aid in the instruction of the law. Such a system could supplement some of the instruction now being given in law schools, but perhaps a more important application would be in training administrative officials, police, social workers, and others whose job requires day-to-day legal interpretation and administration.

One approach to such a system would be as follows: A series of typical factual situations would be posed for each of the conditions of a given statute. In order to ask a question an appropriate selection of a number of conditions would be automatically made such that the conclusion under consideration would be true. A question could be made false by eliminating some necessary conditions, and could be made more difficult by adding some irrelevant condition. In either

case the answer given would be checked for consistency against the given situation and pertinent statutes. The coverage and difficulty of the questions could be structured by a dynamic teaching strategy determined by the nature and quality of student response.

Survey courses for practitioners, advanced law students, and non-lawyers are now taught largely by a lecture method, a method adopted largely for reasons of speed and economy. Automation would allow the institution of more efficient interactive methods for this type of instruction.

Computer-simulated clinical instruction, even without natural language capability, has already proved to be of considerable significance in medical teaching. It could be of similar importance in law if artificial intelligence techniques capable of handling the highly verbal nature of the lawyer-client interview were developed. Prototypes of this approach already existing in the medical area suggest the direction simulated legal clinic instruction can take [12,13,60].

Automated Client and Witness Screening

An experimental program has already been put into use for automated client interviewing at a legal aid office. Because the program lacks natural language capabilities, it can only accept yes/no or multiple choice answers from the interviewee [38]. Addition of natural language interactive capability would greatly enhance the power of such computerized interviewing and allow a real dialogue between the interviewee and the system.

CONCLUSION

The American public is becoming increasingly dissatisfied with the expense, delay, and inefficiency of the legal system. Application of existing computer techniques can help with some of these problems. However, real progress during the next decade demands new directions. Recent success in the field of artificial intelligence points the way for the future of legal automation.

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APPENDIX A

Text of 42 U.S.C. §625 - "Child-welfare services" defined

§625. "Child-welfare services" defined.

For purposes of this subchapter, the term "child-welfare services" means public social services which supplement, or substitute for, parental care and supervision for the purpose of (1) preventing or remedying, or assisting in the solution of problems which may result in, the neglect, abuse, exploitation, or delinquency of children, (2) protecting and caring for homeless, dependent, or neglected children, (3) protecting and promoting the welfare of children of working mothers, and (4) otherwise protecting and promoting the welfare of children, including the strengthening of their own homes where possible or, where needed, the provision of adequate care of children away from their homes in foster family homes or day-care or other child-care facilities. (Aug. 14, 1935, ch. 531, title IV, §425, as added Jan. 2, 1968, Pub.L.90-248, title II, §230(c), 81 Stat.914.)