1. Hypertext

Hypertext is a tool for document management which has been largely developed over the past few years.

Studies which led to the present results are not as new as they might appear, in fact, in 1968, Ted Nelson (who can claim hypertext ‘paternity’) started the famous project Xanadu. However, the most significant steps in terms of application are fairly recent and are linked to recent technological advances.

The utopia envisioned by Nelson of a hypertext net able to link all human knowledge has not so far come about, as demonstrated by Internet. World Wilde Web offers unexpected and extremely concrete solutions because a standard for hypertext on-line management recognized by all gopher servers of the network is already available (HTLM: Hypertext Markup Language).

Hypertext, as it is well known, is a management tool which handles documents elastically and, due to its distinctive features, it can be defined ‘intelligent’. This peculiarity arises out of the fact that it has been devised on the basis of human reasoning, which permits the creation of logical connections for recalling information.

Hypertext, in fact, keeps a logical structure between series of texts, in order to permit the transfer of texts and their logical links to the receiver. Of course, the term ‘intelligent’ must be adapted to the management tool’s ability to deduce information from the links so it can retrieve documents relative to the user’s own informative requirement.

It is understandable that a wide hypertext net could puzzle the user during the first applications. On the other hand, we must consider that www has already more than 3000 servers throughout the world. Although it is too early to appraise such a new instrument, the feeling of getting lost in the net is common to every www user. Therefore, beside the logical
links, which are essential for achieving correct management, browsers are necessary.

From a technical point of view the principle aspects of a hypertext management tool compared to other instruments for electronic document management, are the lack of schemata, the logical links and the ‘navigation’:

The lack of schemata allows the user to simultaneously process documents with a non-homogeneous structure. This characteristic differs from data bases which require homogeneous file construction for their document structure.

The logical links between documents (the basis of hypertext logic) enable the user to proceed from one document to another when a concept expressed in the first one can be explained or mastered in the second. ‘Navigation’ is accomplished when the user reaches the data base. Its meaning lies in moving through the topics in the net by means of links in order to analyze the documents that are necessary to meet the user’s needs.

Topics and links are hypertext applications which demand in-depth research related to the application domain.

Many problems in link organization arise from a lack of tradition in this technique of knowledge organization. The possibility of reaching satisfying results cannot be estimated in advantage, because it depends on the application domain. Studies in each discipline will show the possibilities for using hypertext. Good results have been reached with technical manuals.

An example is given by all the aid provided by Windows, which is, in fact, an example of hypertext.

2. Legal Hypertexts

Many experts have already widely tested the possibilities offered by hypertext techniques in legal studies, due to the fact that legal documents can easily be processed as hypertexts.

Let us emphasize that the logical net created by the lawyer when analyzing a document represents a constituent of knowledge pertinent to the analysis of a specific problem and the possibility of storing the principles behind the links offers the lawyer the opportunity to return to the knowledge expressed in the documentary relations.

Furthermore, it is worth noting that the law may already have tools organized by using logic similar to hypertext, represented by the annotated Codes which, as it is well known, allow us to read the article in combination with all the documents containing notes linked to part of the article. The
first hypertext legal document management tool published in Italy was the *Codici e leggi complementari annotati e commentati con la giurisprudenza* on CD-ROM\(^1\).

On the other hand, due to the large volume of legal documents and to constantly-evolving case law in contemporary legal systems, paper documents will turn out to be rather inadequate and very expensive. Due to the spreading of the computer culture in the law, hypertext will soon be extremely widespread. Naturally, the chances of using hypertext in this field are greater but it is up to lawyers to learn how to organize their own knowledge for the construction of networks of links that are really useful in giving the right information at the right time.

3. ORGANIZATION OF A HYPERTEXT LEGAL NET

A hypertext net consists of three basic elements: the *text*, the *topics* and the *links*.

The text is the basis for the tool and represents the object of the application which manages all texts. The topic is a part of the text and entails a concept or a problem expressed in one or more texts that are linked together and can be of two kinds: *simple topic*, which directly links one part of a text to another text, and *complex topic*, which consists of many topics linked to different texts. The link is a logical bond between two topics in different texts and can be considered ‘active’ or ‘passive’. It is ‘active’ when it permits the user to move from one topic (synthetical expression), to a text (wide expression), it is passive when it allows the user to move from one text to other texts containing the topic relative to the former.

Once all the hypertext elements have been determined, the problem is to find out how to define the links. This is a very delicate thing to do because it is the key to the correct functioning of the entire system. A study of legal documents has led to different kinds of links being singled out:

a) *Explicit links*. These are connections among parts of a text which expressly refer to another text (i.e., explicit citation of a precedent). The study of explicit links is very important for the automated generation of relations.

b) *Implicit links*. As opposed to the explicit links these connections are

\(^1\) Domenico Condello - Ed. Pirola - Laserdata.
not clearly expressed but require human processing. These links can be divided in two subgroups:

- **non-specific implicit links.** When a document relative to a general concept is not expressly found in the text but can be linked to it anyway. Many links of this kind are already provided by large on-line documentation producers. A suitable example is offered by the Centre for Electronic Documentation of the Italian Supreme Court.

These relations can be used to automatically generate hypertext links.

- **specific implicit links.** These are derived from the analysis of a specific context and thus offer better access to the document.

After these preliminary remarks, it is worth noting that the access interface to the hypertext net is of great importance if the whole system is to work correctly.

A prototype developed at the Istituto di Tecnologia del Diritto of Rome concerning the real estate expropriation domain, developed on Garden Knowledge-pro, shows two different means of access: one represented by articles of the Code of Civil Procedure and the other by the hypertext topics index, a typical way of accessing this kind of system.

It has been noted that, while the Code arrangement was very useful, the topics index was not, because the expressive form was too poor for expressing a concept and its related problem. The creation of a wider

![Diagram of real estate expropriation system](image-url)
hypertext would have been too difficult. This inconvenience was overcome in a second prototype, developed on Asymetrix Tool-book, in which the user has access to documents through a graphic interface where all the steps of the procedure appear in sequence of time.

Naturally, this method can be used only when the subject of the study is of a procedural kind, as it can be graphically represented by a flow chart. The advantage of this method, as seen in Fig. 1, is to organize the hypertext so that the user can have easier and more intuitive access. Moreover, this system has a direct control over the logical path the user must cover to get to the data base, and there is the opportunity to pre-establish specific paths pertinent to the context.

These observations result from the first experiments that will be translated into a project about bankruptcy proceedings started by the Institute. The new information system will have a large data base and will be developed on active flow charts. All the knowledge and the conceptual value expressed in the topics and in the links will be used in this project.

4. HYPERTEXT TECHNOLOGY AND ARTIFICIAL INTELLIGENCE

As we have already mentioned, the logical link management gives the user a higher level of knowledge, compared to traditional information systems, but the logical relations must be read in an ‘intelligent’ way in order to attain effective results. The conceptual treatment of topics and links can be the first step in creating a system that is able to process and infer useful information for the user from the routes to take.

Affinities among this and other research systems in artificial intelligence, like semantic nets and expert systems aid in research towards the integration of all these technologies.

In particular, artificial intelligence can support a hypertext or a hypertext can support an artificial intelligence application. In the former case, we can imagine tools to aid the user with automated orientation during the navigation or applications able to analyze the user’s behaviour by deducing his information needs and guiding him through the problem-solving. Applications of this kind would be of great help in the large hypertext nets and, as already mentioned, they could be the first step towards more advanced orientation systems. In the latter case, hypertext could maintain the expert system interpretation profile, typical of legal documents, and transmit it to the user.
5. HYPERTEXT AND EXPERT SYSTEMS

Expert systems treat knowledge in a very different way compared to other data management systems. While databases and hypertext provide documents containing information and leave the user the task of drawing conclusions about their own information needs, expert systems reach concrete solutions by simulating a relationship, with a real expert of the subject.

In the eighties, research into legal informatics was focused upon artificial intelligence, exploring, in particular, the possibility of designing legal expert systems.

Notwithstanding the considerable number of studies carried out up to now, no operative result has yet been reached and legal expert systems are still prototypes because a lot of problems arise in building them during the initial phases. A particular problem has been solved by using a hypertext system linked to an expert system.

In expert systems, the application of legal rules has turned into a syllogism: the rule represents the major premise, the concrete event the minor one and the conclusion is the particular rule of the event under consideration.

The School of New Rhetoric pointed out that legal reasoning is of a dialectical kind, thus the syllogism can be used in legal interpretation and application, providing that the major premise is kept.

On the basis of these remarks, it has been thought that the expert could use hypertext in writing the rules. In this way, he can link all the documents containing the arguments related to the chosen interpretation. Hypertext is directly activated by the conclusions allowing the end user to attain a precise solution to the specific problem, thus realizing the aim of the system, and to critically evaluate the suggested solution by examining the relative documents justifying the chosen interpretation.

This solution has been adopted in the prototype on the 'Expropriation of Property' that, as shown in Fig. 2, has developed an interface which allows the user to simultaneously display the facts and the related solutions as well as to navigate through the hypertext net.

In this prototype, hypertext has even been employed to aid the user in communicating the facts describing the case to the system.

As we have already shown, the right solution suggested by the system depends entirely on the statement of the premises. The minor premise is represented by the specific event introduced by the user. If there are elements which can give rise to doubts, links leading to clarifying the texts
have been pre-established. Fig. 2 illustrates a screen with a help window open on a fact. The words in the box in the solution and in the help window are directly linked to documents. The presence of a marker in correspondence to a fact, indicates that the required document is present in the event pointed out by the user.

6. Conclusions

The ideas and methods set out here arise from experience on local tools. It is interesting to conclude by referring to the possibility of employing this form of organization together with Internet tools. During the development of the prototype on the ‘Expropriation of Property’, the work group identified the following objectives:

- Intuitive graphic interface;
- Integration of different applications (data bases, hypertext and expert systems) in a single environment;
- Interaction between user and expert systems with options to probe the suggested solution;
- Problem simplification.
Research led to the development of an integrated information system, whose organization is briefly described in Fig. 3.

All this could be reproduced on Internet with the MOSAIC program which is a public domain application developed by NSCA, available for all working platforms. MOSAIC offers a graphic interface to protocols on Internet and introduces a new protocol HTTP for managing HTML files. MOSAIC can be programmed and has an API structure which permits external applications on every net server to be activated. Thus, it is possible to reproduce the graphic elements which represent the rule, making them active, and to design expert microsystems in advance with external applications activated by the boxes.

This environment allows for the construction of a system identical to the one developed in Windows with Toolbook, with the advantage of involving many centres in actual loading and organization by employing the potentiality of the system client server.

Perhaps the concrete possibility of transferring this application from a local management system to an on-line management net is not so close. There are many operational difficulties in the use of a graphic on-line system with the XII protocol.

Therefore, work on the infrastructure will condition the possibilities for actually using Internet.