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Legal Theory and the Design of MILIEU

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Abstract

This paper describes an ongoing project in which a LKBS is being developed to support police officers with the task of enforcing penal environmental legislation. The LKBS (named MILIEU) qualifies crimes, indicates which proof should be furnished and provides detailed instructions if and how environmental samples should be taken and handled. Usually, LKBS builders are confronted with a large number of problems and (let's be optimistic) an even larger number of solutions. Hence, the task of building a LKBS implies taking many design decisions. The speed and ease with which these decisions can be taken, can be enhanced if decisions are based on a overall model or theory about the legal domain the LKBS relates to. Within the Milieu project, design decisions, such as the choice of the task structure and many details of the formalization, are based on a legal theory about how penal environmental law should be applied.

1 Introduction

The aim of this paper is twofold. A first aim is to discuss the role legal theories may take in the process of designing and implementing Legal Knowledge Based Systems (LKBS). A second aim is to report on an ongoing project at the Computer/Law Institute of the VU-university in which a LKBS is developed. The reason to consider these subjects together is that legal theory has had a substantial impact on the design and implementation of this particular LKBS.

The project to develop a LKBS is performed in cooperation with the Environmental Hygiene Department of the Forensic Science Laboratory (FSL). This Laboratory is a division of the Ministry of Justice and carries out analyses and investigations to gather evidence for criminal cases. In the case of environmental crimes, evidence gathering often depends on the analyses of environmental samples. In practice, however, performing these analyses is often frustrated for reasons that will be explained more thoroughly in section two. The problems are incorrect sample taking and the fact that requests for analyses do not explicitly state with which provision the offender will be charged, leaving the FSL in the dark about the question what evidence should be furnished by the analysis. At the request of the FSL, the Computer/Law institute is currently developing a LKBS in order to study the possibilities to overcome these problems with knowledge-based-system techniques. The name of this LKBS is MILIEU. The name originates from the Dutch word for environment. Also, MILIEU stands for Multi Inferences for Legal

Indictment of Environmental Undesirabilities. It was decided that as a starting point, MILIEU should cover the domain of illegal litter burnings. Since the scope of the system is on the whole domain, a top-down approach was taken.

What can be found in this paper? Section two introduces the problem addressed in MILIEU and describes an initial model to solve the problem. Section three describes legal theory and particularly legal theory in the domain of penal environmental law. Section four explains how MILIEU operates and how legal theory relates to the architecture of MILIEU.

2 The Problem

Penal law enforcement of anti-pollution regulations is one of the relatively new tasks of the Ministry of Justice and the police. The argumentation needed to prosecute offenders of anti-pollution regulations often depends on evidence that can only be obtained through the analyses of samples taken at the scene of the crime. Taking environmental samples and making requests for analyses is often carried out by local police officers. Carrying out the analyses is the task of the Environmental Hygiene Department of the FSL.

This procedure causes two kinds of problems. Firstly, the taking of samples is often not performed in accordance with the appropriate procedure leading to the situation that either the appropriate analysis cannot be carried out or that the evidence resulting from the analysis will not hold in court.[1] Secondly, the requests for analyses often lack the necessary background information. In particular, the provision the offender will be charged with is often not provided. To the FSL, the information is important to determine what exactly has to be proven which in its turn determines the kind of analysis that has to be performed. Moreover, the law sometimes describes which analysis should be performed and how the results are to be interpreted. In general, the background information allows the FSL to set up an efficient examination (FSL concept FT-norm 401.05., 1994).

To overcome these problems, the FSL created a model which initially served as the basis for MILIEU. This model, referred to as the FSL model, describes how the police officer should reason in order to make an appropriate request for analysis at the FSL.

The FSL model is not very sophisticated, but it expresses the idea that penal provisions should play a crucial role in deciding which analyses are necessary. The model describes a process of zooming in from the facts to the provision, and, from the provision to the appropriate request for analysis. The general idea is that the police officer first determines which provision fits the situation and then determines which analyses should be requested to prove this provision. The next section presents part of the legal theory that governs the domain of penal environmental law. It will become apparent that, similar to the FSL model, provisions also take a central position here.

[1] For reasons of simplicity, the term 'analyses' is used to denote the type of investigations the FSL can perform. The range of investigations to prove environmental crimes, is actually larger.

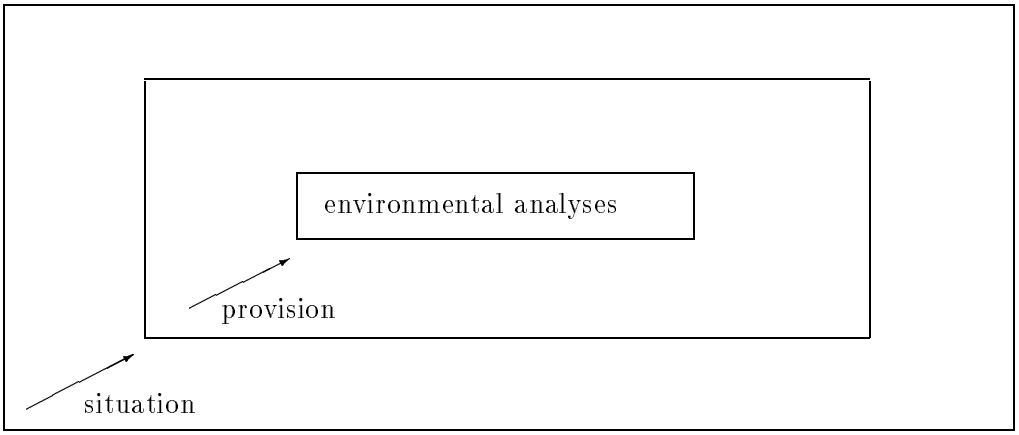

Figure 1: The FSL model.

3 Legal Theory

A LKBS functions within a specific legal domain. To obtain guidance from legal theory in building a LKBS, one should look at general legal theory as well as specific legal theories within the domain of interest. MILIEU functions within the domain of penal environmental law. Before presenting legal theory in the domain of penal and penal environmental law, some words will be spend on the question what a legal theory is in general and which part of it was used as a guideline to the design of MILIEU.

Legal theory is not an easy concept. Schroth says: "Will mann heute formulieren, was der Begriff 'Rechtstheorie' bedeuted, so gert mann in Bedrngnis" [Kaufman, 1985].[2] Probably for this reason, most writers on legal philosophy circumvent giving a definition. For instance in em Legal reasoning and legal theory, [MacCormick, 1978], despite the reference in the title, does not give a definition. We will not try to do this either because legal theory can hardly be defined in a satisfactory manner. Nevertheless, insight in its meaning can be obtained from studying taxonomies in which legal theory has a place. [Aarnio, 1987], for instance, considers all theories describing different aspects of legal systems and praxis as legal theories. He creates a hierarchy of theoretical approaches in which legal theory is a part of legal philosophy. Legal theory branches out to, among other things, the application of law. [Bruggink, 1993] on the other hand, distinguishes between theory of law in a broad sense and legal theory in a restricted sense. He considers the overall theory of law a theory in which sociology of law, dogmatics of law, legal theory in a restricted sense and even legal philosophy all take their own position. According to Bruggink, most researchers consider legal theories in the restricted sense as theories about the dogmatics of law and at the same time theories about related

[2] Although it might be argued differently, we simply assume that the German and Dutch word 'rechtstheorie' refers to the same concept as the English words 'legal theory'. Probably, if variation in meaning exists, this variation is overwhelmed by the variation in meaning different writers attach to the concept.

activities: creation of law and application of law. Thus, although both classifications differentiate on important points, both consider theories about the application of law a part of legal theory.

Primarily, application of law is a task of judges. The outcome of legal disputes is determined by the application of rules in the specific domain but also depends on the application of general and domain specific legal principles. Legal principles, almost by definition, are expressed in a very abstract way. Important to the design of MILIEU is the part of legal theory which describes how the principles are set to work, i.e. how judges should apply the law in order to give full weight to the operation of legal principles in the legal process.

The main legal principle within the domain of penal law is the principle which since Von Feuerbach goes as the adagium "nullum crimen, nulla poena sine praevia lege": no penalty shall be inflicted if not provided by law. Today, the main purpose of this principle is to achieve legal security and legal equality, to prevent arbitrariness and to protect from an overly active punishing government (cf. [Enschedé, 1990]). An almost inevitable derivation of the nulla poena principle is the principle of lex certa which implies that the legislator should describe as precisely as possible which conduct is punishable. Without the lex certa principle, the nulla poena principle could be trivially satisfied by the drawing up of a very general penal provision.

The nulla poena principle and the lex certa principle also address the behaviour of judges in criminal courts. In fact, these principles very strongly limit the discretion of judges because the decision whether a criminal offence has been committed and the offender should be punished depends first of all on the description of the penal provision provided. Although the content of penal provisions may vary, the way in which they should be applied by judges is invariable. [Enschedé 1990] presents a legal theoretical scheme how a judge should apply the law in order to punish an offender. This legal theoretical scheme prescribes a number of components that should all be proven. An important component of this scheme is that the act in itself should be punishable. The description of a punishable act is found in provisions of law. The provision of a punishable act is divided in several components called legal factors. An act is only punishable if all the legal factors of the provision are fulfilled [Bemmelen, 1989]. Hence, each factor has to be proven in its own right.

Now we turn to the question what exactly is a legal factor. To this end, we have to differentiate between penal Law and penal environmental Law. In the literature on penal law much attention has been paid to the distinction between legal factors and so-called exclusions of punishment. This distinction may be troublesome if a legal factor is formulated as an exception in which case its appearance may be very similar to an exclusion of punishment. The distinction is important because of the way argumentation is arranged in a penal process. The Public Prosecutor has to state and proof all factors in the indictment while he does not have to state and proof that the exclusions of punishment are not applicable. It is sufficient if the exclusions of punishment, usually brought forward by the defence, are considered 'not unlikely' by the judge. Generally, in penal law the factors can be rather straightforwardly derived and distinguished from the exclusions of punishment. The text of the provision is usually conclusive because it is generally understood that an exception stated in the context of the provision is placed there on purpose by the legislator and thus constitutes a legal factor. Other exceptions

usually constitute exclusions of punishment [Hazewinkel-Suringa, 1991]. According to [Buiting, 1993], to determine the status of an exception in penal environmental law one should, among other things, consider the importance of the exception to the system of environmental care. For instance, in penal environmental laws the use of licenses and releases is very common. Often, a system of licenses is used to regulate common behaviour which is, in general, not considered undesirable, but may lead to environmental undesirabilities if conducted without restrictions. Thus, licenses are an essential component of the environmental care system and statements refering to licenses can therefore be considered legal factors. Releases, on the other hand, are usually ment to allow behaviour wich is, in general, considered undesirable and are therefore exclusions of punishment [Buiting, 1993].

The legal theory just described relates both to the way judges apply the law and to the way the Public Prosecutor arranges the argumentation in a penal process. For two reasons, legal theory is also important for the way police officers should behave. Firstly, police officers may only bring action against an offender if they have the presumption that a punishable act was committed. By comparing the incident in question to the description of penal provisions, they decide if it is possible that indeed a criminal act was committed. Secondly, the activities of the police end with the drawing up of an official report. This report is the basis for the indictment of the Public Prosecutor which in turn is the basis for the decision of the judge.

4 How MILIEU operates

This section describes how MILIEU performs the task of supporting the police officer in taking samples and making a correct application for analysis to the FSL. As section two describes, wrong sample taking and requesting analyses without delivering the necessary background information constitute problems for the FSL. Also, section two presents an early suggestion how MILIEU should perform this task: the FSL model. This model is based on the observation that the actual problem in the current state of affair is that police officers seldomly state the provisions the offender should be charged with. In section three, the legal theory necessary to charge and successfully prosecute an offender was given. This legal theory had a substantial influence on the following subjects of the paper: the task structure of MILIEU and the way legal knowledge is formalized.

4.1 The task structure

Which provisions are of interest to the task of MILIEU? All provisions with the potential of being applicable in the case of illegal litter burnings serve as a starting point. Whether a provision can actually be used to charge an offender depends on whether all legal factors can be proven. The question whether a legal factor can be proven depends on details of the case at hand, and, if these details are nor sufficient, the evidence the FSL might offer. It should be noted that MILIEU never has knowledge about the actual results of the analyses carried out by the FSL because MILIEU's task ends at making the request for the analyses. However, MILIEU does have knowledge about the nature of the evidence the FSL can offer. More specifically, for each legal factor, MILIEU knows if and under what circumstances the legal factor can be proven via analyses and

dictates what samples and information are needed for the analysis. Obviously, since legal theory prescribes that all factors should be proven, an analysis is superfluous if it is used to prove a legal factor of a provision that contains other legal factors which cannot be proven. Hence, MILIEU is only interested in a provision if all legal factors can be proven either directly by reference to the facts of the case at hand, or, indirectly via the results of an analysis carried out by the FSL.[3]

The way MILIEU carries out its task can be regarded as a process in which an initial set of potentially applicable provisions is made smaller and smaller. This process can be divided in six phases, each phase taking a specific subtask.

In the first phase, MILIEU asks the user a number of questions leading to an initial factual description of the case at hand. The objective of this phase is to filter out all provisions which cannot be applicable because the negation of one or more of its legal factors can be deduced from the facts of the case at hand. The questions posed, aim at denying legal factors within the provision directly or indirectly. For instance, one of the legal factors of section 8.1 of the Environmental Protection Act[4] is that the forbidden act takes place inside a so-called establishment. MILIEU asks the user where the alleged forbidden act took place. If the user has provided MILIEU with the information that the act took place in the open, MILIEU has the knowledge to derive that the negation of the legal factor is true which is in direct conflict with section 8.1. Hence, this provision can no longer be applicable.

In the second phase, again information is obtained about the case at hand. However, this time the questions aim at establishing whether evidence for legal factors of the remaining provisions can be based on the facts of the case at hand. For instance, section 10.3 subsection 2 of the Environmental Protection Act contains the factor that the establishment concerns itself with the disposal of litter of others. In case of a litter burning, MILIEU may ask where the litter came from. If the litter originates from others, the legal factor can be considered proven.

In phase three, a number of checks is performed. An important check is whether any of the provisions can be considered proven at this stage, i.e. the necessary evidence can be based solely on the facts of the case at hand. If such provisions are found, MILIEU asks whether continuation is necessary because the user might consider the provisions found a sufficient base for prosecution. If MILIEU continues, the only provisions MILIEU will be interested in are those that contain at least one factor which is not proven and of which the negation is also not proven. Possibly, the evidence for these factors can be obtained via analyses of the FSL.

Until phase three the reduction of the set of relevant provisions was based on the facts of the case at hand. In fact, both facts confirming and facts denying the applicability of provisions may have limited the original set. In phase four a further reduction of provisions is obtained by investigating whether the FSL can offer suitable analyses to proof the factors that are still unproven. Obviously, if no method exists to prove a particular legal factor, the provision which contains this factor cannot be applicable any more and therefore has to be removed from the set.

[3]The last statement needs one small modification which may come as a surprise. Since the task of MILIEU is to support making correct applications for analysis to the FSL, MILIEU is actually not interested in a provision which can be proven solely on the basis of direct evidence.

[4]Wet Milieubeheer.

In phase five, MILIEU checks whether a particular sample taking can be performed in the current situation. To establish this, MILIEU may start a question session for each of the factors that still needs to be proven. For instance, due to section 10.43 of the Environmental Protection Act, it is illegal to dispose of dangerous litter. 'Dangerous litter' is a very well defined concept in dutch environmental law. One of the methods of proving that dangerous litter has been burned is through the analysis of ashes at the scene of the crime. Obviously, if there are no ashes left this method does not apply. If this is the only method available to prove this legal factor, the factor and thus the entire provision cannot be proven by this method.

Phase six presents the results. Due to the filtering of the previous phases, the set of relevant provisions now only consists of provisions that contain at least one factor that might be proven with the assistance of the FSL while the other factors are already proven based on the facts of the case at hand. These provisions, as well as instructions how to take samples and how to handle the application, is now presented to the user.

The phases one to six are a description of the task structure of MILIEU. This task structure has a strong procedural character, i.e. a number of steps is carried out in a predetermined, largely fixed order. MILIEU is written in a shell in which, among other things, a procedure can be implemented straightforwardly as a sequence of steps, each performing a specific subtask. One such subtask is interacting with the rule base of MILIEU. Often, the results of such interactions determine the finer details of how the task structure is executed. For instance, at the start of phase five, the task structure asks the rule base to supply all the provisions still relevant. If no provisions are available (any more) phase five is skipped. Otherwise, MILIEU chooses one of the provisions to elaborate.

4.2 Formalization

Within MILIEU's rule base, legal knowledge and knowledge about sample taking is formalized in a manner presented in [Groendijk & Herrestad, 1993]. Here, the main interest is to the representation of legal knowledge, more specifically, the formalization of the penal provisions applicable in the domain. The legal theory of penal environmental law influences the formalization in an obvious way. Legal theory prescribes that in order to apply an penal provision all factors of the provision must be proven in their own right (conf. section 3). Therefore it was decided that a penal provision should always be formalized in such a way that the antecedent of the rule expressing the provision consists of a conjunction of factors,[5] i.e. the antecedent may not be or contain formalized disjunctions. However, legal factors may and do contain disjunctions. For instance, provision 10.43 of the Environmental Protection Act contains the legal factor 'waist disposal on or in the soil'. Such a disjunction is kept out of the formalization of the legal provision itself, i.e. the disjunction is not made explicit but remains in the proposition. Obviously, such disjunctions may be worked out in 'lower' rules. Those who have studied the task structure carefully may note that the task structure would not work correctly if provisions were formalized differently. This is, however, not the reason why formalization is done as described. The cause is the underlying legal theory which has shapen both the task structure and the formalization.

[5]The rule base of MILIEU allows more then two facts in a conjunction.

There are many problems attached to the task of formalizing legal rules. There are two problems that have to be addressed here specifically. A first problem is, that it is not always clear which statements should be considered the legal factors of a provision. This is especially the case if statements refer to exceptions. To decide on this we have turned to [Buiting, 1993] which presents a legal theory within the domain of penal environmental law prescribing what constitutes a legal factor and what constitutes an exclusion of punishment (conf. section 3). In MILIEU, exclusions of punishment are formalized differently from legal factors. For legal factors containing an exception, the explicit negation is necessary to conclude that a provision is applicable, while, for exclusions of punishment the negation as failure is sufficient. Also, within the formalization of MILIEU legal factors are associated with methods to proof the factor itself. These proof methods, for instance analyses by the FSL, are persued if the truth or negation of the legal factor cannot be established immediately. Since the proof of exclusions of punishment is not the responsibility of the Public Prosecutor or police, MILIEU does not contain knowledge about proof methods for exclusions of punishment.

A second problem is that some provisions cannot be formalized simply by creating one rule with an antecedent containing a conjunction only, because the provision contains two completely different forbidden acts. For instance, section 14 of the Soil Protection Act[6] deals with both circumventing soil pollution and cleaning already polluted soil. As a solution, this provision is formalized as two different rules each dealing with one situation only.

5 Discussion

In the foregoing, we have described the legal theory within the domain of penal environmental law and how it has facilitated designing and implementing MILIEU. This section discusses why it is important to choose legal theory as the primary model for designing LKBSs. The necessity to use some sort of a model is taken here as a starting point. We take the same point of view as Breuker that even a wrong model is better then no model at all [Breuker, 1988].

Obviously, the recognition that a model is needed does not provide us with one. The question which model should be chosen is determined by many factors. Within traditional A.I. probably the main reason for using models is interpretation, i.e. the model helps to interpret the knowledge that has to be incorporated in the KBS. This is even more so within the legal field. On the surface, legal rules may seem to have a very clear and definite meaning. In practice, however, rules are not that clear. In particular, in many legal domains, the interpretation of rules and the way they should be applied is influenced by the legal principles applicable in the domain. As a result, knowledge of these principles is vital for interpreting the rules. However, principles cannot be mapped to rules directly. Hence, a body of theoretical knowledge, a legal theory, is needed to describe and prescribe how rules should be interpreted and applied to give operation to the underlying principles.

[6] Wet Bodembescherming.

6 Conclusion

Initially, the central guideline towards the development of MILIEU was the FSL model. The task of MILIEU is to offer support for sample taking and requesting analysis. However, as a result of the FSL model, the primary focus in the design process aims at the provisions offenders can be charged with. Working this FSL model out in detail revealed that it was in fact a legal theory on how provisions should be applied that had to guide the development of MILIEU. Adopting legal theory has lead to a large number of advantages some of which relate to the fact that the development of the LKBS was taken as a model-driven activity and some advantages due to the specific fact that this legal theory was used. Firstly, legal theory provided us with a general top down view on the domain. Secondly, once we had adopted legal theory as the central guideline, the task structure emerged very naturally. Thirdly, the legal theory showed how provisions should be formalized. From the experiences gathered sofar, we feel justified to conjecture that MILIEU will be easily extendible and maintainable. Although the experiences were gathered in one project only, we feel that many of the advantages described also apply to the development of other LKBSs in other domains.

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