



Ecli-Law: A simulated environment for problem solving in the field of law

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Abstract

This work begins with a journey through the fundamentals of design when solving legal problems. A fascinating journey that starts in our mind, by the way in which we prepare it to solve problems and to examine our strengths and weaknesses in problem solving. We will define the underlying concepts and rules useful in problem solving. Finally, we will describe a few key concepts which are useful to the designer as tools are to a craftsman. We apply these concepts to problem solving in legal matters. We also consider the setting up of a simulation environment in the solution of legal problems by using a very powerful open source environment: Eclipse.

1 Introduction

Problem solving dissemination activities are complex. Students come to university courses with little knowledge of logic and of analysis and synthesis concepts. There is therefore the issue of spreading the fundamental concepts of problem solving and the construction of the algorithms used to do this. It is also necessary for students to learn how to work together, in groups and for them to seek solutions to problems of gradually increasing complexity, developing a critical mind. The way to approach problems for their resolution is not only rational, but above all creative. To develop creative thinking means to give space to forms of expression that are thought to be marginalized in certain disciplines ranging from law to computer science which are generally dominated by rationality and logic.

This applies to all courses in which we should share knowledge and solve problems starting from a complex series of facts or axioms. It is for this reason that in this paper we have worked to develop an integrated environment of tools that can be used for educational activities (but not only) within the university. The tools are open source and hosted on a general and extensible architecture capable of encouraging and promoting the construction of innovative solutions. This architecture is a Component Based Software Engineering (CBSE) type and is known as the Eclipse platform.

2 Analysis and Synthesis in problem solving

Western thought is based on the analysis of deductive reasoning. We give this analysis the same importance of the search for truth. It is natural to aim at analyzing this because it is easy to teach. To neophytes it will provide some case studies and they will be asked to analyze the situations that these cases arise. It is a typical behavior. Bach in his *Ein Musicalishes Opfer* (A Musical Offering) (Hofstadter, 1985) gave his students a musical theme and some clues and asked them to analyze the situation by building a canon¹. This brought to the 10 canons present in the opera dedicated to Frederick I, King of Prussia.

We use the analysis to break down complex situations, full of unknown elements, into recognizable and accessible ones.

In the analysis our interest is directed towards the question what is?

In the project the question is what could be?

It was always thought that once you have analysed a given problem you have revealed the truth. It is like having a good map on which are listed all the

¹ The canon is an issue as opposed to itself (such as the nursery rhyme known as "Fra Martino Campanaro")

roads and you just have to choose the direction.

In short, analyzing a situation, we split it into its elements, which are then recombined using the synthesis in order to have a response or action. Unfortunately design is not just an assemblage of certain objects. We need new concepts and these concepts do not arise simply from the synthesis of separate elements. In this case we need to design a process and we require a way to proceed. The design uses information and it uses logic characteristics of creativity that deviate from our often rigid and schematic way of seeing things: They deviate from rational thought resulting in a lateral one (De Bono, 1998a; 1998b; 1996; 2002). We must broaden the meaning of the word project that is not only what could be, but we must resort to it whenever routine is not enough. An analysis, rather than reveal a map where the way is drawn, should make us start from the assumption that a map only presents the shape of the ground and that we must plan the streets. Design is the basis for action and as such it always aims to realize something: it is pure creativity, and unfortunately, it often happens that it is in contrast with the projects. What can we do when there are conflictual situations between several projects? The result is the characteristic of Western thought made up of discussions, negotiations, wrestling, strength training, etc.

In the United States there is an interesting procedure for the resolution of conflictual situations. In some states it is required by law but it is not often used because it is disliked by lawyers. In normal situations of conflict, both sides start from extreme positions, knowing that gradually they will try to reach a middle position of compromise. This way of “designing” the solution involves an enormous waste of time and money. In the alternative procedure the two sides never meet. Each party plans a sensible solution, subject to a court arbitrator who must choose which of the two solutions is more reasonable in the interests of those involved. That is why both sides will strive to develop a reasonable solution. All efforts and polemical debate is spent now in designing the best solution. If both sides have done a good job in designing a reasonable solution it will no longer matter what the judge decides. It is no longer a game where the winner takes it all and the loser is left with nothing. Both parties will be the winners. But an interesting aspect is that in this procedure, all attention is paid to the design rather than to the discussion. This metaphor makes us understand how important it is to single out concepts from project activities in order to remove bells and whistles and discussions which take away energy and time but do not provide solutions. In addition, there must be a strong attitude towards creative thinking and problem solving because they govern the process of solution building.

3 Problem solving in legal issues

Whether you take on the role of deputy magistrate of a dispute, or that of the lawyer engaged to draft an opinion pro-veritate, or even that of the notary dealing with a corporate merger, you are asked to solve problems.

What does it mean in practice to solve a legal problem?

We will see that problem solving is essentially to decide and then make choices. By definition, our system does not admit the possibility that a court cannot decide a dispute (s.c. *non liquet*). But also the legislator, when passing a law, chooses to protect certain interests rather than others. The citizen decides when he/she is asked to base his/her behavior on the content of a negotiated clause. The lawyer decides when he/she performs the necessary work to solve problems submitted to him/her, such as beginning to choose which class of problems belongs to the individual situation.

We can anticipate that lawyers may face different problems, such as: the choice of the most appropriate defense strategy in a trial or the definition of the most appropriate strategy to achieve a certain goal, and so on.

In the first example, we will focus on the problem more intuitively: case solution.

The ability to solve problems is divided into three distinct phases (corresponding to an equal ability): a) the identification of the problem, b) the finding of the rule (law, jurisprudence or doctrine) that applies to the problem, c) the application of the rule to the problem. In order to set a strategy, consisting in the steps listed above, we must possess specific skills that in turn require other skills.

Phase a) requires formal logic skills and relational skills as well, for example, when one has relations with the person who is presenting the case to determine the exact contours by making relevant circumstances come to surface and by discarding unnecessary and misleading ones.

Phase b) requires knowledge of research strategies in the immense wealth of sources of law, jurisprudence and doctrine. The task is difficult because such data are available on both traditional paper (Pascuzzi, 2008) and on the most advanced electronic databases. The user must put in place a real research strategy to determine the most effective query to retrieve documents actually relevant to the solution of the problem investigated on. Because computers respond to specific commands (though over time they have become increasingly friendly query languages), all is resolved in designing a proper search string: it contains conditions that must exist in documents to find (such documents must contain a certain word, or must be after a certain date, and so on). Electronic information retrieval systems have great potential because they allow to apply computation principles to the logical reasoning used by Boolean operators.

Phase c) requires both ability to understand and to interpret a text. In addition, if a lawyer is called to give an oral solution (eg. the lawyer's speech in court), he/she will also have to have rhetorical and oratorical skills (ability to master use of oral language). If, however, the solution must be contained in a written document (eg court decision) he/she will need to master the skill of writing a text (for example, if we have to draw up a contract, a will or a text of law).

4 An oriented approach to logical inference: Eclipse- Law

The specificity of legal problems requires a natural activity of logical deduction and inference from a lot of data, often still in paper. On many issues the law is often susceptible to differentiation from region to region, from municipality to municipality. So it is certainly not desirable to develop a simple search conscious legal conclusion: the case is often customized. There is thus a need to have a special environment where the traditional information retrieval systems marry with mechanisms of abstraction and logical deduction and interpretation of content in order to be a support for the specialist, and that is why Ecli-Law was created. Sometimes these systems have to coexist in mixed situations of paper, dematerialization and computerization. Prolog language use is suitable for certain operations, the logical-deductive ones, inherent to a jurist's work. Ecli-law is an open source environment that lets you describe and make use of rules to solve legal issues. Ecli-Law belongs to the wider Eclipse-L architecture environment, under the Eclipse IDS subsystem. Ecli-Law benefits from Eclipse technology (Eclipse, 2010a; Eclipse, 2010b; Maresca, 2008a; Maresca, 2008b) and SWI prolog (SWI, 2010) to describe and perform abstract and formal rules extracted from legal documents.

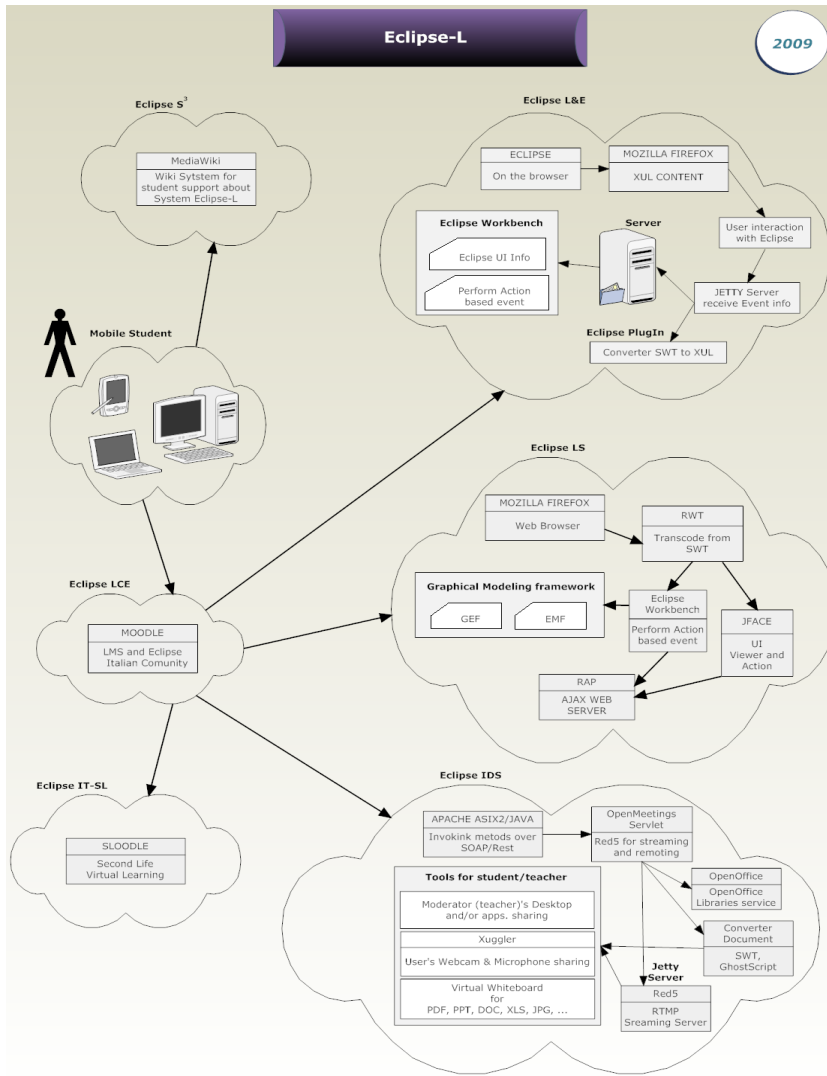


Fig. 1 - Eclipse-L system architecture detail (2009).

In this architecture we can use the Ecli-Law environment and we can use it through the sub-environment IDS for the resolution of legal problems. In particular, figure 2 below shows the architecture of the environment Ecli-Law. Web servers and application servers are on the same machine as is the database server, but we prefer to keep this separate, due to the specific domain application. For what concerns the application, it was developed in SWI Prolog within Eclipse and thus can build and enforce rules, but it can also carry out research,

as indicated in the previous paragraph without ever leaving that environment and interacting with different databases.

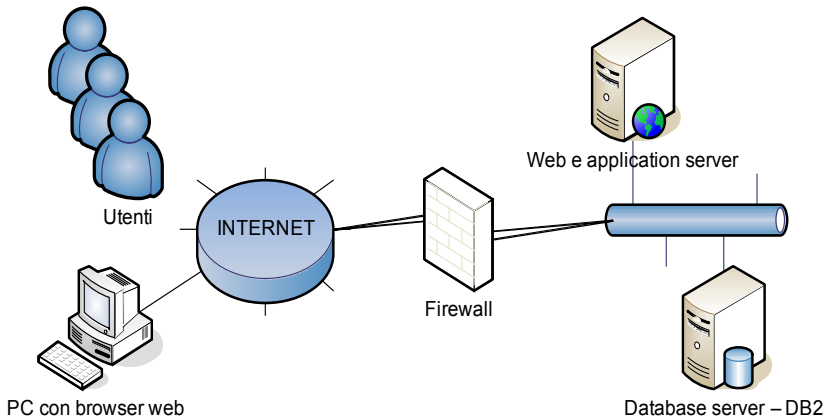


Fig. 2 - Ecli-Law architecture environment (2009).

5 Legal distances in construction: a case study

The building activity is regulated by some articles of the civil code, as well as by a number of other state laws and laws and regulations valid at a local level (Pascuzzi, 2008; Pascuzzi *et al.*, 2008).

In terms of the distances to be observed between the buildings there are, in particular, local rules and regulations that are more stringent than the civil code and State laws in defining the distances, the volumes, the conditions that determine the legal distance.

The issue concerning the protection of public interests as well as the relations between neighbors has very often provoked, and will continue to provoke, disputes. This, however, has favoured the increase of law cases. It thus:

- gathers information and organizes it internally as efficiently and effectively as possible;
- produces the answers to the questions of the users as requested, highlighting, when there is a need, the deficiencies of the database available.

The questions, in general terms, can be summarized as follows:

- How far is XXXX from YYYY ?
- What information do I get to learn about the distance relatively to....

Figure 3 shows the ER schema of the database on which you can perform

queries of the type previously stated.

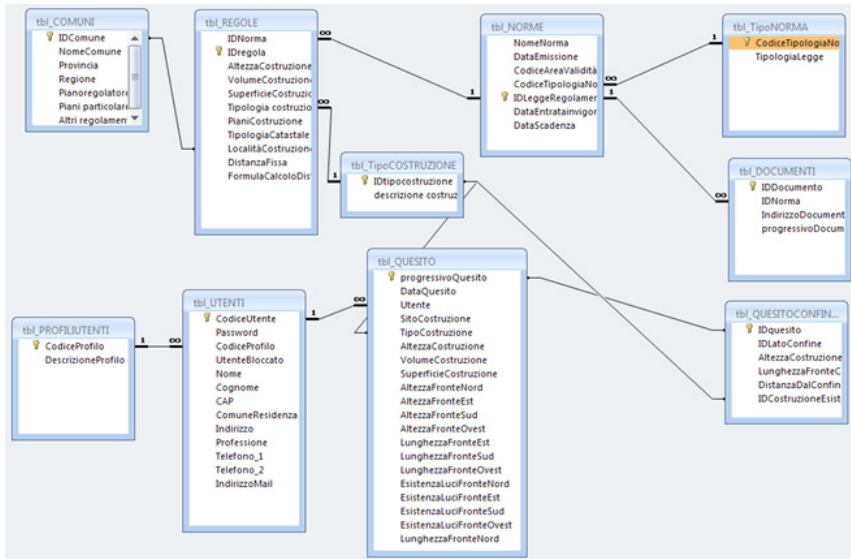


Fig. 3 - E-R database model of Ecli-Law.

Fig. 4 shows the interface for entering queries which are then transformed into Prolog rules and have to find satisfaction in the database of the present facts, norms and legal rules.

Of course these rules and norms undergo many changes simply as they are inserted in Fig. 4 by the user. In fact, they undergo many transformations that preserve integrity and significance and which for reasons of brevity are omitted here, to become prolog rules and, as such, must be unified in the database of Prolog facts. Given the specificity of the legal problems of distances, they can also be distributed. The project status is at the stage of creation of the first prototype but the architectural design of the high-level and detailed data base and the main user interfaces have already been created.

Supporto alle decisioni per la definizione delle
DISTANZE LEGALI da rispettare nelle COSTRUZIONE DI EDIFICI

Immissione Quesito

progressivoQuesito DataQuesito TipoCostruzione Utente

SitoCostruzione AltezzaCostruzione VolumeCostruzione SuperficieCostruzione

LunghezzaFronteNord:
AltezzaFronteNord:
EsistenzaLuciFronteNord:
LunghezzaFronteOvest:
AltezzaFronteOvest:
EsistenzaLuciFronteOvest:
LunghezzaFronteEst:
AltezzaFronteEst:
EsistenzaLuciFronteEst:
LunghezzaFronteSud:
AltezzaFronteSud:
EsistenzaLuciFronteSud:

Conferma e Inserisci altra regola Conferma e Esci Esci dall'applicazione

Fig. 4 - Ecli-Law main interface.

Conclusions

This paper shows an environment to support problem solving in legal environments, it is designed on an open source Eclipse platform.

The environment is in use and is being tested in the laboratories of the DIS faculty of Engineering at the University of Naples Federico II, at the University of Trento and at the University of Genoa DIST. This project has definitely placed emphasis on the possibilities offered by Eclipse, especially with regard to knowledge sharing among different users. The project will develop many approaches and simulations will reach many people to compose and share rules supporting a legal document. It is an anticipation of the use and reuse of distributed data repositories with potentially significant future developments. It will be possible to make services better and they will no longer be bound by place, time and paper resources, for they will be in constant motion, surrounded by an environment equipped with many possible points of access for construction and decision support.

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