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## Integration of an Analogical Reasoning Model in a Model of Case Resolution

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The resolution of cases in law depends on the generation of metaphors by analogy. It progresses by association, affinity and juxtaposition of two divergent ideas in an integrative approach. To argue a case, a legal expert cannot limit himself to the perception of isolated facts, but instead must find affinities between fields expressing more cohesion in law. In this paper, it is argued that the legal specialist relies on abstract categorization to discover a precedent and thereby create a metaphorical link that serves in the argumentation stage, and also later on in the resolution of the case. On this basis, a model of case reasoning is charted that integrates a model of analogical reasoning. In the same manner, a model of analogical reasoning is designed that combines quality induction and deduction. Furthermore, it is advocated that a rich representation of a law category is required to make a good induction. Similarly, it is specified that quality induction should be constrained by abstract rules in order to preserve legal principles and compute profound similarity between cases to discover the precedent. A better grasp of analogy can help us to improve legal information retrieval as well as legal case-based reasoning.

(Author)

### 0. Introduction

The persistent gap between law categories and litigious cases has made it vital to resort to metaphor (H. Araj, 1997). These metaphors express the relation between a new case and a precedent. They demonstrate that the discovery of precedent may not be reduced to linking cases according to the lexical analogies, but rather, that the generation of a distant analogy or a metaphor relies upon an abstract network of knowledge. In this text, an effort is made to comprehend how a Common Law expert connects analogous cases by convergent thinking to discover the precedent and to resolve a problem. To this end, I will present the concepts that have served in the conception of an analogical reasoning model integrated with a case resolution model. I will also chart a model of analogical reasoning that will explain how a jurist generates metaphors in categorizing cases according to abstract criteria.

### 1. The model theoretical foundation

Generally the criterion used by a modellist to achieve his goals derives from a theoretical construction. The theory serves to explain a phenomenon via verbal lan-



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guage in accepting its limits. The model replicates the theory (same object), facilitates the elimination of ambiguity and offers more precision and intelligibility. Furthermore, solidarity between the theory and the model assures a greater comprehension of the phenomenon. The theory intervenes in the model elaboration which in turn permits one to test the theory and thus gain a better understanding of the reality. In the absence of a theoretical construction, it is by the assimilation of legal arguments to cognitive linguistics that the more salient aspects to the resolution of legal problems should be identified. I would support the following arguments relevant to the resolution of cases:

1. A convergence between the interpretative method and the Common Law.
2. The teleological nature of problem resolution.
3. Resolution of conflict as a method to eliminate competing possibilities.
4. The associative nature of case resolution.
5. Creativity as an essential aspect of the resolution of cases (the role of metaphor).
6. Reasoning by analogy leads to categorization of cases according to abstract qualities which is expressed in metaphorical links.

With regard to analogy, I will promote the following propositions:

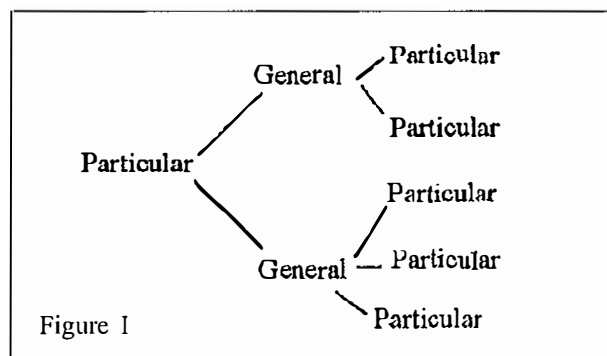
1. Analogy is not a form of reasoning that goes from particular to particular.
2. Similarity computation is a difficult process.
3. Analogy is not the equivalent to similarity.
4. Analogy is a kind of hybrid reasoning since it shares the qualities of deduction and induction. Analogy that leads to the creation of a metaphor is equated with an induction plus a deduction.
5. Analogical inference should be refined.
6. There are constraints on quality induction.
7. The computation of an analogy is based on a rich description in abstract connections.
8. Metaphors conform to world order, not to language order.

This unifying attitude is distinct from the strictly legal approach; its emphasis on a methodology that is characterized by the confrontation of the arguments that arose in divergent disciplines and by the reconciliation of these arguments, leaving aside the particular language distinguishing each field. Furthermore, the concept coordina-

tion proceeds to enrich, fertilize and promote the evolution of a specific domain. From this point of view, the integration emerges as a requisite facing the inability of the disciplinary approach to respond to a complex problem that goes beyond the barriers of a limited area of knowledge (H. Araj, 1996).

## 2. The integrative model of legal reasoning

The adoption of an interdisciplinary perspective invites us to think that comprehending analogy can only be realized in the light of a case reasoning in inclusive mode. The principal reason favouring the study of analogy in connection with case reasoning is that analogy functions in tandem with argumentation and decision making. Two interwoven models should serve in the explanation of the precedent discovery process. The first model will help to describe the broad lines that characterize the resolution of a case, in the Common Law as well as in codified law (figure 1). The second model will assist in the explanation of analogical reasoning that is blended together with case resolution. This scheme will illustrate how to reproduce an analogical or metaphorical expression (figure 2).



### 2.1 Resolution of case model

In the Civil Law tradition, interpretation is confined to quality induction where a case (particular) is related to several rules (general). The selection of one rule does not occur in perfect harmony, but in a competitive mode of elimination. As in Civil Law, the resolution of a case in the Common Law is based on quality induction and resolution of conflicts. But what distinguishes the Common Law is that the combination of induction and deduction leads to the creation of a metaphor linking two particulars. Narrowly speaking, analogy characterizes only the Common Law, but on a broader scale, analogy is as much at the core of Civil Law as induction is at the core of analogy. To illustrate, I will explain how the ROM (new case) is linked to translation (precedent) in order to answer if the ROM is subject to the copyright protection. The metaphorical link between new case and a precedent, (ROM is a translation), is done by tying the term ROM to an abstraction (translate). This bond is created if the conditions of similarity are met and if it is pertinent to connect (ROM) to the abstraction (translate) by quality induction. The link to the abstraction allows the deduction of (translation), (Code Morse transcript), (Piano

rolls), (Sleeve diagrams), etc. These objects create a series of decisions, linked in a complex fashion, which stands as an expression of legal continuity.

Cases are ordered in continuity from a new case to a decided case. To compute a relation between an object "totally unknown" to the law (ROM) and another "known" one, it is necessary that "what is totally unknown" become "known" under certain aspects. For example, the status of the ROM completely unknown by the law should in fact be known under the scientific aspect. The computation of similarity between the ROM and the text translated in Morse does not go from the totally unknown to the known, but from the less known to the more known. Therefore, from what we know we compute what we do not know.

However, we must bear in mind that even in the best of conditions, the metaphorical link between a new case and a precedent is only plausible, but not certain. Each metaphorical junction remains a weak relation that can be broken since it favours one position over the other one. The judge is the person that analyzes each metaphor to reach a decision. He can invalidate a metaphorical connection by placing emphasis on points of dissemblance. The judge may also decide that two cases are similar by adopting two different criteria to assemble them. Two cases x and y could be similar regarding the aspect W or Z, or dissimilar regarding the aspect V or T. This reflection may be schematised in the following manner:

$s(x,y)$  on the point W  
 $s(x,y)$  on the point Z  
 $d(x,y)$  on the point V  
 $d(x,y)$  on the point T

The metaphor based on the aspect W conceals one part of the reality, which is the aspect Z (resemblance) and the aspects V and T (dissemblance). Therefore, it becomes easy to find the arguments that enforce one perspective over the other. It is also possible to emphasize on dissimilarities by disallowing the analogical expression, and by consequence, the ideas that it carries. Conversely, instead of contradicting the existing analogy between (x,y), that lies on Z or V, we look to an object (o), that resembles (x) in a different aspect (Z) with different legal consequence. An argumentation with three objects is illustrated in the following way:

$s(x,y)$  on the point Z with the consequence A  
 $s(x,y)$  on the point V  
 $d(x,y)$  on the point T  
 $s(x,o)$  on the point Z with the consequence B  
 $s(y,z)$  on the point R

Linking cases according to the doctrine of precedent by analogy must also include a discussion of the competing analogies to reach a decision. Generally, two cases could be similar without necessarily leading to the same conclusion. In this case, similarity is not in question, since the judge presents the circumstances of the case and determines the equity questions to demonstrate that the application of the same rationale to two cases would lead to

absurdity. Therefore, the legal decision stands on the distinctions that the judge draws between analogical links in the hope of reaching a fair decision (W. Twining and D. Miers, 1991).

The resolution of a case by establishing a connection between two cases has as a goal to unite cases not only in the guise of transferring legal rule, but also by adding nuances to the rules. This manner of considering the rules of law as evolving and not fixed in advance to resolve all cases is illustrated by Levi, who stated:

If this were the doctrine, it would be disturbing to find that the rules change from case to case and are remade with each case. Yet this change in the rules is the indispensable dynamic quality of law. It occurs because the scope of a rule of law, and therefore its meaning, depends upon determination of what facts will be considered similar to those present when the rule was first announced. The finding of similarity and difference is the key step in legal process (E. Levi, 1948).

In fact, every time a new case arises, the understanding of the case enriches the comprehension of the rule, based on the comparison between a particular case and a general rule. Therefore, reasoning by analogy does not only promote resolution of problems, but allows the rule to evolve and also encourages discussions at the level of the legislation. In this perspective, new realities confronted legal categories that afterward favour linking cases, which in turn leads to the modification of the law (J. Frémont, 1993).

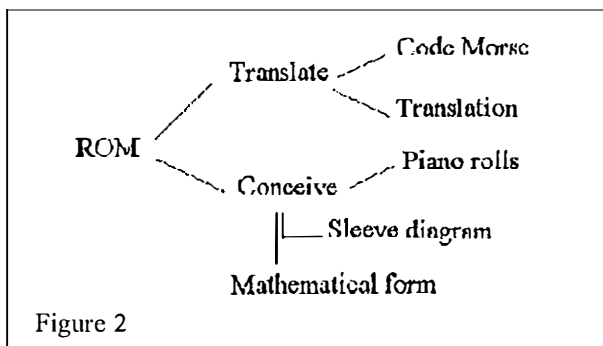


Figure 2

## 2.2 Model of reasoning by analogy

If case-based reasoning implies the discovery of possible links followed by the judge's analysis, the discovery of precedent by the rule interpretation is equivalent to an induction plus a deduction. Each metaphor acts as a premise in a deduction, which could be incorporated in the argumentation phase and afterwards in the decision making. To accomplish a valid analogy we need:

1. Semantic knowledge
2. Valid induction
3. Deduction

By providing the possibility of relating a new object to a predicate in the copyright paradigm, we create analogies and metaphors since every predicate unites a set of cases that could be either homogeneous or heterogeneous, but which share abstract qualities.

### 2.2.1 Semantic knowledge

Semantic categories linked to verbal activities form the knowledge on which induction is applied. To consider a case to be an instance of a legal abstraction, it should meet the semantic conditions necessary for the accomplishment or the realization of this action. It is by the recognition of an abstract similarity between the case and the abstraction that we can produce an induction. The conditions of similarity involved in the induction decision lead to the creation of a bond between the case and the category according to the following model:

If a case (a) possesses the network of qualities xxx  
If the abstraction A possesses the network of qualities xxx

The case (a) is an instance of the abstraction A by induction

The link between a case and an abstraction could be more complex, since the two objects are not instances of a single abstraction, but of a similar abstraction. Metaphor generation could be represented by the following scheme:

The case (a) is an instance of the abstraction A  
The case (b) is an instance of the abstraction B  
Both abstractions A and B are similar  
The objects (a) and (b) are similar

To represent the semantic knowledge necessary to obtain a valid induction, it is important to create a model that corresponds to a logic of actions analysis, to determine the composition of each action and to translate this knowledge into a formal language. To illustrate, I will take as example the action of translation which is the required abstraction to connect the ROM as a new case with translation as precedent.

#### 2.2.1.1 Decomposition of a verbal categories model

Verbal categories can be ranked from the more complex to the less complex. The action of translation could be analyzed as follows:

Translate (complex action)

Read = movement of the eyes + recognize + comprehend + interpret +

Write = read + hand movement + convert + compare

Each verbal category is composed of a network of intrinsic qualities. A rich description in intrinsic qualities accommodates profound reflections regarding our being. Generally, we express intrinsic qualities by using a network of attributes that could be more or less complex.

#### 2.2.1.2 Decomposition model for each verbal category

Each verbal category is based on a group of explanatory conditions. These conditions are:

1. The intentional conditions
2. The intellectual conditions
3. The physical conditions
4. The transitional conditions



In order to render the computation of similarity possible, each category should be qualified by relying on profound or semantic qualities. The decomposition in necessary and sufficient conditions allows a characterization of action at a causal level, which is the knowledge indispensable to create an inductive link. The translation of the activity of "translate" according to the syntax of predicate logic in a "script" model incorporates the basic knowledge on which inferential and pragmatic knowledge is applied. The representation in predicate logic provides the following script:

## 1. TRANSLATE

Name of the scenario: translate a text

### The conditions of translation

To translate, the agent has to be engaged in a time ( $T_{goal}$ ) to translate and execute a plan in an interval of time ( $T_{real}$ ) and write in an interval ( $T_{write}$ ).

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happen(translate(agent,text), $T_{translate}$ ) ==>
  during( $T_{read}, T_{translate}$ ) &
  during( $T_{write}, T_{translate}$ ) &
  before( $T_{write}, T_{write}$ ) &
  intent(translate(agent,text), $T_{translate}$ ) &
  happen(read(agent,text), $T_{read}$ ) &
  happen(write(agent,text), $T_{write}$ )

```

### Pre-conditions

To translate, the agent should have a goal (Z), the agent must have the motivation to realize its goal in an interval ( $T_{translate}$ ) and that he must possess the physical and intellectual resources to translate ( $T_{translate}$ ).

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intent(translate(agent,text), $T_{translate}$ ) ==>
  before( $T_{goal}, T_{translate}$ ) &
  has-goal(agent,Z, $T_{goal}$ ) &
  motivation(realize(agent,Z), $T_{translate}$ ) &
  possess(agent,physical resources,t) &
  possess(agent,intellectual resources,t).

```

### Effects

The translation is the conversion of a language (a) into a mental representation and the conversion of a mental representation into language (b) in the interval of time ( $T_{translate}$ ).

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translate = (convert(agent,from(languageA,representation)) &
  convert(agent,from(representation,languageB)), $T_{translate}$ )

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The knowledge of copyright of semantic categories has the potential to produce analogies and counter-analogies necessary to argue according to divergent goals. This knowledge reflects not only the position of individuals needing to protect their works but also of the person who wishes to exclude their achievements from the protection of copyright. In fact, from the same network of knowledge we can produce the analogy and the counter-analogy that express a contrary idea; everything depends on each individual goal argumentation. Furthermore, this knowledge is the cornerstone for decision making and justification.

## 2.2.2 Valid induction

To ensure that induction does not lead to aberrations, the measure of similarity is applied to profound knowledge, which is guaranteed by the semantic component. Analogy requests valid induction, and valid induction requires a serious computation of similarity which brings foreign cases together; creating new similarities out of existing ones. In order to obtain a valid induction, it is useful to conduct the computation of similarity by knowledge. The knowledge necessary to obtain a good induction:

1. Inferential knowledge
2. Pragmatic knowledge
  - The teleological conditions
  - The argumentation conditions
  - The conformity conditions
  - The rule of precedent
  - The maxims of interpretation

Computation of similarity without boundaries leads to a dangerous situation; this is why induction must be refined. The achievement of a greater resemblance does not happen in a chaotic manner, since a good induction may not, in fact, be based uniquely on similarity. Therefore, similarity must be constrained by inferential and pragmatic knowledge.

## 2.2.3 Inferential knowledge

Many elements are involved in the computation of similarity. The most important among these are:

1. The presence of attributes
2. The absence of attributes
3. The importance of attributes, one to the other
4. The number of attributes in common
5. The agreement between the attributes
6. The disagreement between the attributes
7. The points of dissemblance in common

Qualitative similarity lies on a rich description of attributes which are not available in the computation of quantitative similarity used in most information retrieval systems. The knowledge of similarity in concert with pragmatic knowledge allows to bring cases together according to abstract qualities.

## 2.2.4 Pragmatic knowledge

To assure that the computation of similarity between a case and an abstraction will not hinder the law continuity, pragmatic conditions should constrain the evaluation of similarity. The goal of the litigant, the aim of the law and the principles of interpretation are the conditions that impede the case from attaching to the abstraction by induction in breaking the rule of law. The teleological conditions emerge from what the judge considers to be the goal of the law. The conditions of argumentation are the immediate goal of the litigant. They allow the litigant to argue in favour of one position or another in order to direct the computation of similarity. The preference of certain aspects of a case over other aspects prioritizes one point over the other. In fact, each link favours one aspect of the case considered to be the most important. A defender of copyright would stress the aspect

of the object that encourages its protection. The other party however would stress the aspect that denies protection. Finally, the standards of conformity to the rules of precedent could also form an important consideration in associating a case to legal category. The researcher in artificial intelligence (D. Berman & C.D. Hafner, 1993) consider the importance of teleological arguments to discover precedents. In this approach, the claims of the legal philosopher, who considers that reasoning according to rule of precedent follows the legal principles are confirmed. From this perspective, the necessary knowledge to correct the weakness of the search for similarity remains crucial. In order to create an analogy that consists of uniting two cases, inductive reasoning should be followed by deduction.

### 2.3 Deduction

Induction realized in the past and stored under a legal category can be retrieved by deduction. Each legal category simultaneously accommodates old cases and as well as new ones. Induction is realized as follows:

If a case (a) has the network of qualities xxx  
If an abstraction A has the network of qualities xxx

---

The case (a) is an instance of the abstraction A

If the case (b) has the network of qualities xxx  
If the abstraction A has a network of qualities xxx

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The case (b) is an instance of the abstraction A

If the case (c) has the network of qualities xxx  
If the abstraction A has the network of qualities xxx

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The case (c) is an instance of the abstraction A

By deduction, we are able to find the metaphoric equivalences. The process of metaphor generation could be schematized as follows:

The cases (a),(b) and (c) are instances of A

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Therefore, the cases (a),(b) and (c) are similar

The cases (a), (b) and (c) forge a metaphorical or an analogical association. Therefore, it is by integrating induction and deduction that the generation of an analogical expression is made possible.

### 3. Conclusion

Fusion between fields allows the creation of a case reasoning model that distances itself from the purely legal model on many issues. The strictly legal model assimilates reasoning by analogy to case-based reasoning. In an integrative model, the role of analogy is estimated in concert with argumentation and decision making. It is by the mixage of induction and deduction that an analogical junction is constructed. Similarly, induction is considered not as a form of reasoning that can be restricted to the computation of similarity, but instead as a complex method of reasoning that

make legal principles and cognitive rules intermesh. The constraint on induction consists in furnishing the computation of similarity with abstract knowledge, to guide the inference and furthermore to constrain the similarity inference by pragmatic arguments. The more the computation of similarity is constrained, the more chance to achieve a good induction. The less the computation of similarity is constrained, the less we have the chance to obtain a valid induction. Similarity plays an important role in induction; for this reason, it is important to control the search for similarity so that bringing together of cases may be useful and valid. Therefore, to remedy the defect of common similarity, we should be guided by accurate knowledge. Therefore, it is by constraint on induction that a distinction is made between a good induction and an aberration.

Legal systems are considered more on the basis of their differences than on their convergence. Although there is an obvious difference between the two systems, there is common ground between them in the use of analogy to solve problems, in resolving the conflict between rules and in guiding the argumentation on teleological grounds. Furthermore, in both systems, the legal expert moves from the less complex to the more complex: from analogy to deduction, from deduction to argumentation, and from argumentation to decision making. This model unifies the two methods in disproving the difference between the expertise of reasoning in the common law and the Civil Law. The similarity shared between the two systems is far more important than their differences. Thus analogy is the springboard to understand legal reasoning and afterwards to design more customized systems that shape the particularity of each one.

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