

On Modeling Creativity in Legal Reasoning

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Abstract

In this paper we address the problem of how new categories and new interpretations can be created in legal reasoning. We present some examples of such creativity, and then analyze them to identify the mechanisms that must be modeled for incorporating creativity. We point out that many of these mechanisms can be implemented by using components of already existing systems. Based on this analysis, we outline our approach, which uses a blackboard style architecture to generate creative arguments. Top-down processes are activated by portions of rules or *ratio decidendi* of precedents. Bottom-up processes are activated by the facts of the current case and precedents. The retrieval of precedents is also modeled as a blackboard process, so that which precedents are examined is determined dynamically depending on the contents of the blackboard. We compare our approach with existing research and then briefly mention future research problems.

1 Introduction

There are many instances in legal reasoning where one could say that a certain degree of creativity was involved. Moreover, this creativity can be glimpsed both when reasoning with precedents as well as when reasoning with rules. Sometimes the creativity lies in making a precedent seem similar to the current case, sometimes it is in distinguishing a precedent from the current case in some new way, and at other times one can find it in a novel application of a statutory predicate to the facts of the current case. As the term 'interpretation' is often used in the literature on legal reasoning to refer to the process of making two cases seem analogous, making them seem distinct, or applying a statutory predicate to the facts of a case (Twining and Miers 1982), perhaps we could say that the focus of our research is to understand and model the process of generating *new interpretations*.

This research is motivated from our previous work on creative analogies and metaphors [Indurkha 1992; 1997], where it is proposed that a new perspective on some object or situation (a *case* for a legal-reasoning system) can result from applying the higher-level description of one object to

the low-level description of another object, and the underlying process is that of change of representation. We are now importing this idea to the domain of legal reasoning, and an outline of our approach is presented here.

This paper is organized as follows. In the next section we present some examples of legal reasoning where a certain degree of creativity was involved. In Sec. 3, we identify the mechanisms that need to be modeled to incorporate the kinds of creativity embodied in our examples. In Sec. 4, we discuss how these mechanisms can be modeled. In Sec. 5, we present an outline of our approach to modeling creativity. In Sec. 6, we illustrate our approach by showing how an example mentioned in Sec. 2 can be modeled. Then, in Sec. 7, we briefly discuss related research. Finally, in Sec. 8, we summarize the main points of this paper and mention future research problems.

2 Examples of Creativity in Legal Reasoning

2.1 Creativity in Using Precedents: Making and Un-Making of Analogies

When applying a precedent to a new case, the issue always is whether the precedent is similar to the new case or not: if the precedent is similar then it supports a similar decision for the new case, otherwise it does not. Now in some situations, this reasoning seems somewhat straightforward: the legal experts generally agree on what the significant aspects of the new case and the precedent are, and the issue in dispute is whether the shared aspects between the new case and the precedent are sufficient to make the precedent apply to the new case; or the differences between them are significant enough that the precedent does not apply to the new case. However, in some other situations new categories are created to distinguish a case from a precedent or to apply a rather dissimilar precedent to a new case. Here are some examples (some of these examples are also mentioned in Rissland and Skalak 1991):

1. In the case of *Weissman*, 751 F.2d 512 (1984), a college professor sought to obtain tax-deduction for home-office expenses. The taxpayer cited the case of *Drucker*, 715 F.2d 67 (1983), where a concert violinist was allowed to claim tax-deduction for maintaining a studio at home where he rehearsed. The lawyer for the Commissioner tried to distinguish *Drucker* on the grounds that the employer of the concert violinist provided *no space* for rehearsal, but the employer of the college professor provided an office (it was a shared office, with

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not enough security). However, the judges claimed that *Drucker* is similar to *Weissman* because in both cases *no suitable space* was provided by the employer.

⇒ A new category 'suitable space' is created so that a precedent can be applied to the new case.

2. In the case of *Soliman*, 94 T.C. 20 (1990), an anesthesiologist claimed tax-deduction for his home-office expenses. Majority of the Tax Court judges decided to grant the deduction. However, there was the precedent of *Pamaranz*, 867 F.2d 495 (1988), an emergency-room physician who was denied tax-deduction under very similar circumstances. One difference was that while S. spent about 30 home-office. The judges distinguished *Soliman* from *Pamaranz* arguing that S. spent a *substantial* amount of time at his home office but P. did not.

⇒ A qualitative category 'substantial' is created to emphasize a quantitative difference.

3. The *Drucker* case [of a concert violinist], 715 F.2d 67 (1983), itself involved a creative argument. Before *Drucker*, the courts used to consistently apply the *focal-point test* to determine whether a taxpayer is allowed to claim tax deduction or not. According to the focal-point test, if the focal point of the taxpayer's business activity is at the home-office than they are allowed tax-deduction, otherwise not. Now the Tax Courts, 79 T.C. 605 (1982), argued that the focal point of a concert violinist's business is the concert stage, and denied the tax deduction. But the appellate court argued that concert stage is the focal point of D.'s employer's business, which is not necessarily the same as the business of D. According to this court, D. was in the business of being a musician, and the most important part of being a musician is to rehearse. Thus, the focal point of D.'s business was carried out at his home studio, and he qualified for tax-deduction.

⇒ A category is split into two: 'employer's business' and 'employee's business'.

4. The *Soliman* case went all the way to the Supreme Court, 113 S. Ct. 701 (1993), where the minority opinion cited a precedent, *Texas v. New Jersey*, 379 U.S. 674 (1965), that seems very dissimilar at first. The precedent involved a case concerning escheating: a rule that allows the state to claim uncollected debts of a company. This precedent was made relevant in the following manner. S. was seen as a self-employed taxpayer. His home-office, where he did administrative work, was seen as his 'main office', and the hospitals where he actually saw and treated patients were viewed as branch offices. Now in the cited precedent, the issue was: which state has the right to escheat a company's unclaimed debts — the state where it is incorporated, the state where its main office is located, the state where its branch offices are located (where most business is done), or the state where the person to whom the debt was owed was last known to reside. In the opinion written for the precedent, at one place the terms 'main office' and 'principal place of business' were used interchangeably. The minority opinion used this fact to support their argument that S.'s home-office is his principal place of business.

⇒ A *structured representation* is created for the new case. A precedent that is similar with respect to this

created representation is retrieved to support the argument.

2.2 Creativity in Applying Rules: Novel Ways to Categorize

When applying a rule (e.g. a statute) to the facts of a case, the issue is whether the predicates appearing in the rule apply to the facts of the case or not. I provide below two examples where a certain amount of creativity was involved in this process (many more examples can be found in Twining and Miers 1982, Chap. 1):

1. In the case of *Baie*, 74 T.C. 105 (1980), a hot-dog stand operator claimed tax-deduction for the kitchen at home where hot-dogs were prepared. One argument made by B. was that her kitchen was the home-office and the principal place of business. Another argument used was that her kitchen was a *manufacturing facility* of the business. It is this latter argument that we consider creative. (The judges remarked: "We find this argument ingenious and appealing, but, unfortunately, insufficient to overcome the unambiguous mandate of the statute." [74 T.C. 110 (1980)].)

⇒ The category 'manufacturing facility' is applied in a novel way to the kitchen where hot dogs are prepared in a novel way.

2. This is a fictitious example, adapted from a short story by the popular thriller writer Frederick Forsyth. It concerns a gun law, which makes it a felony to be in the possession of a gun, but allows an exception for home. A young man, who is some kind of mechanic, is arrested for having a gun in his van. His lawyer argues that his client keeps his tools and equipment in his van and does repair work there, so it is his workshop. Sometimes his client also sleeps in the van on long work-related trips when he cannot get home at night. So his van is his 'home', and the exception clause to the gun law should be applied to him.

⇒ The category 'home' is applied in a novel way to the van.

3 Some Observations Based on the Examples

In all the above examples, we notice that the underlying process is that of *categorization*: the creativity lies in applying an existing category to the facts of a case in a novel way (when arguing from rules), or coming up with a new category in order to analogize or distinguish two cases (when arguing from precedents). In particular, we can identify the following mechanisms that can be used in generating creative arguments:

1. *Specialization*: Two situations A and B are such that A has category P but B does not have P. The objective is to analogize A and B. Then make P more specific until it does not apply to A also. (e.g. 'provided space for work' is specialized to 'provided *suitable* space for work').

Notice that when a category is specialized, its complementary category is generalized. Thus, the above example can also be viewed as a generalization of the category 'not provided space for work' to the category 'not provided suitable space for work'. However, as we focus on what happens to the category, and not on the

effect of generalization or specialization, we prefer to call this a specialization.

In this example specialization is used for analogizing. It can also be used for distinguishing. For example, if A has P and B has P also, and the objective is to distinguish A from B, then one can specialize P until it applies to one but not the other. (e.g. A and B were both provided 'space for work' but only A was provided 'suitable space for work'.)

2. *Generalization*: Though we did not present an example of it, one can imagine an inverse operation where a category P that applies to A (but not to B) is generalized until it applies to B also. For example, if A is a college professor, and B is a high-school teacher, one could generalize the two categories to 'teacher', in order to analogize A and B. In theory, generalization can also be used for distinguishing. A and B need to be distinguished. Find a property P that both A and B do not have. Generalize P until it applies to one but not the other. But because there are basically a large number of properties that an object *does not* have, this mechanism is not computationally viable.
3. *Split*: This is a special kind of specialization. Basically, split a category into two so that one part applies to A and the other to B. (e.g. business of employer and business of employee.) It can only be used for distinguishing, but not for analogizing.
4. *Make Quantitative into Qualitative*: If some quantitative difference can be found, then try to find a qualitative term to capture this difference. The adversarial move would be to advance a qualitative term that blurs the quantitative difference.
5. *Restructure*: Build a structured representation of one object or situation, and use this structure to access other similar precedents. If the structure is changed, then different precedents will be considered 'similar' and retrieved.
6. *Redefine*: Look for alternative definitions of the category, and see if the situation satisfies the conditions for an alternative definition. (e.g. application of 'home' to van, or 'manufacturing facility' to the kitchen.)

4 Towards Modeling Creativity in Legal Reasoning

We now examine the problem of how to incorporate these mechanisms in a legal reasoning system. There are really three major issues underlying the six mechanisms mentioned above — (1)–(4): how to create new categories (to analogize, distinguish, or describe a quantitative aspect qualitatively); (5): how to use structure-based dynamic retrieval of precedents; and (6): how to come up with novel ways of applying existing categories. We will first consider each issue in turn, and propose some ideas for modeling it. Then in the next section, we will outline an architecture that integrates all these ideas.

4.1 Creating New Categories to Analogize or Distinguish Two Cases

A major problem that must be addressed in modeling the creation of new categories is how to constrain this process so that only reasonable categories are created, for given the

facts of any case, one can generate an endless number of categories that apply to it without coming up with any useful legal argument. We approach this problem in two stages. In the first stage, we use the desired conclusion of the argument to focus attention on a precedent, and decide whether we would like to analogize or distinguish. This can be done following the approach of Cabaret (Rissland and Skalak 1991), where the desired point-of-view for the new case and the decision for the precedent are combined to decide on one of the four strategies (argument stances), and then one of the four tactics (argument moves) are used to realize the chosen strategy. (Though our architecture is different from Cabaret in a number of significant ways as will become apparent in Secs. 5 and 6.)

Even after two cases have been identified, and it is determined whether we want to analogize or distinguish them, there can be many ways to achieve this goal: a category can be specialized or generalized in several possible ways. However, most of these 'creations' may not make a proper argument. To create a category in a reasonable way requires a lot of world knowledge. For example, to specialize the category 'employer did not provide space' to 'employer did not provide suitable space' requires an understanding of the employer-employee relationship, the significance of this category to the purpose of the law, etc. Although, it is possible to represent all this world knowledge, and provide enough guidance to a system so that it can 'discover' this specialization, we feel that any such approach must be necessarily *ad hoc*.

One way to address this problem is suggested by our past research on creative metaphors (Indurkha 1992), where it is shown that creative insights can result from applying the concepts and categories related to one object to the low-level description of another object. Following this idea, we propose that the created categories come from the high-level descriptions of *other* cases or rules. We can explain this better using two of the examples presented in Sec. 2.1 above.

- In Ex. 1, the category 'suitable space' comes from another precedent *Cousino*, 679 F.2d 604 (1982), where the court ruled that a junior high school teacher was not entitled to home office tax deduction, because the school provided him with his own classroom and he had access to an office equipped with a phone so that his employment-related duties — namely teaching, preparing for lessons, grading, and talking to the parents — could be carried out at the school. Therefore, the court concluded, C.'s use of his home office was not for the 'convenience of the employer'.
- In Ex. 3, the category 'substantial' comes from a proposed regulation by the IRS, which contains the following text: "If an outside salesperson has no office space except at home and spends a *substantial* amount of time on paperwork at home, the office in the home may qualify as the salesperson's principal place of business." (quoted on 94 T.C. 26, emphasis added).

Thus, we advocate that along with the facts of each precedent, we keep a high-level description of how and why the precedent was decided in a certain way. This can be done following the approach of Branting (1993), which shows a method for representing *ratio decidendi* of a case. Then the categories used in the description of one case can be applied to the facts of another case. This approach also requires that tenuous rules such as the purported purposes of the law, or proposed regulations, which are not legally binding,

are also represented in the system so that their categories are available for being applied to new cases, should the need arise.

It may seem that by taking this approach, we are really modeling 'discovery' of categories rather than 'creation'. We do not wish to dispute this characterization, but would only like to add that in that case many so called creative acts, such as coming up with a new metaphor in poetry, or a new way to solve a problem would also be characterized as acts of discovery. As long as such acts are included in the same class as the process we are interested in modeling in legal reasoning, we do not care whether they are dubbed as 'creation' or 'discovery'.

4.2 Structure-Based, Dynamic Retrieval of Precedents

This concerns the aspect of creativity illustrated by Ex. 4 of Sec. 2.1: How can a seemingly dissimilar case be retrieved from the facts of the given case? The standard dimensional approach of Hypo (Ashley 1990) does not work well here because the two cases are not only very different, but the commonality between them is such that it is hard to imagine that a legal expert would encode their shared aspects as a dimension at all. What aids the retrieval is that in the high-level structure being constructed for the new case (*Soliman*), the category 'main office' or 'administrative headquarters' is applied to the home office. Given that the goal is to show that the home office is the 'principal place of business', we are interested in finding any support to claim that 'main office' can be equated with 'principal place of business'. The support can come from a rule (which may be tenuous rule) in which the two terms are equated, or from some precedent where the two categories co-apply. Thus, although the search domain is rather wide, the object of search is very narrowly specified.

This search would require looking into the facts and opinions of the case, as searching via the existing dimensions of the precedents, though it can be accomplished rather quickly, may not be sufficient. In our example, it is doubtful that a legal expert would include a dimension that contained 'principal place of business' or 'main office' while entering *Texas v. New Jersey* case into the knowledge base. Even if they did, the effect would be to note that the state in which the company's 'main office' was located *was not* given any right to escheat the unclaimed debts. To retrieve this precedent requires that all the arguments put forth in the written opinions of the case be represented in more or less the same form (it may be necessary to impose the isomorphism condition proposed by Bench-Capon and Coenen 1992, though recently Routen 1996 has questioned whether it is possible to impose this condition at all). In our example, the only connection to *Texas v. New Jersey* case is that in the opinion, the court argued that if the right to escheat was awarded to Pennsylvania, where the principal business office of the company were located, it "would raise in every case the sometimes difficult question of where a company's 'main office' or 'principal place of business' or whatever it might be designated is located." [379 U.S. 680 (1965)] Thus, integrating this mechanism requires a dynamic retrieval mechanism triggered by the argument being constructed, and a detailed representation of the opinions written for the precedents.

4.3 Novel Ways of Applying Existing Categories

The third issue is how to model the novel application of an existing category, as in applying 'manufacturing facility' to the kitchen or 'home' to the van. We believe that this can

be modeled by incorporating a top-down component *a la* Cabaret (Rissland and Skalak 1991). For example, if the goal is to argue that the taxpayer qualifies for home office tax deduction, then all the rules that have this goal as their consequent are activated, and we try to see if the antecedents of any of them are satisfied by the facts of the new case. The antecedents, in turn, may activate other rules, and so on. At some point, the issue becomes whether a category, such as 'manufacturing facility', or 'home', can be applied to the new case. To determine this, we need to represent all the different sets of conditions that are necessary or sufficient for that category to be applicable, and see how far those conditions are satisfied by the given facts. Even if not all the conditions are satisfied, we can still try to show that either they are not necessary, or they are satisfied in some other way, following the exact same approach as in Cabaret.

5 An Architecture for Modeling Creativity

We can now integrate the observations of the last section into the outline of a model. Our proposed model is based on the approach of Hofstadter and his colleagues (Hofstadter and the Fluid Analogies Research Group 1995), where a parallel distributed architecture, and a mixture of top-down and bottom-up control structures are used for modeling creativity in analogies. (At this time we do not use the probabilistic aspect of their architecture.) It also uses many components from the systems implemented by Rissland and her research group: in particular, the design of our top-down component is based on the Cabaret system (Rissland and Skalak 1991) and the design of the bottom-up component is influenced by the BankXX project (Rissland, Skalak and Friedman 1996). We also incorporate the ideas proposed by Branting (1993) on how to represent *ratio decidendi* of precedents. Below, we list the key features of our model:

- A multi-layered representation is used for each precedent. At the lowest level, facts of the precedent are represented. At the highest level, its *ratio decidendi* is represented using statutory concepts and categories. The intermediate levels contain those concepts and categories that connect the statutory concepts to the facts.
- Statutory knowledge, heuristic knowledge, purpose of the law and other extra-legal factors, and world knowledge is all encoded as rules. (This is not to say that it is a simple matter, for as Hage (1996) has shown, it is quite complex to represent these different sources of knowledge, and to use them in a reasonable way.)
- A rule can connect concepts and categories on any one level, or between adjacent levels. Rules of the latter kind correspond to 'reduction operators' of Branting (1993).
- The process of generating an argument for the new case is seen as that of coming up with a representation for it (in the highest level) given its facts (in the lowest level).
- An intra-level rule can work in both the forward and the backward directions. An inter-level (reduction operator) rule can work in both the bottom-up and the top-down directions. The forward and the bottom-up directions amount to drawing some conclusion from the facts. The backward and the top-down directions

amount to checking if some desired conclusion can be supported by the facts.

There are some significant and far-reaching implications of these features that we should perhaps elaborate a bit. One is that a precedent really becomes a multi-layered network of rules, except that there may be many facts at the lowest level that are not connected to anything in the higher levels. (All those facts that do not end up affecting its *ratio* would be left unconnected.) Secondly, the dimensions are not explicitly represented with each precedent. In fact, the knowledge typically embodied in dimensions is distributed in two places in our model: in rules used in the *ratio* of precedents, and in rules that correspond to heuristic legal knowledge.

Both these factors make the retrieval of precedents in our model quite different from the conventional dimension-based CBR systems such as Hypo (Ashley 1990). There are basically two ways in which a precedent can be used [in our model] to support an argument being constructed. One is that if [a part of] the argument being constructed for the new case uses a rule or a network of rules that was used in the *ratio* of a precedent, then that precedent can be used to support the argument. The other way is as follows. A rule that is being used for constructing the argument is applied to a precedent. The rule is not a part of the *ratio* of the precedent, so one needs to apply it to the facts of the precedent as if it were a new case. If the precedent is found to satisfy the rule, it can be used to support the argument for the new case. (For example, the *ratio* of *Cousino* case, namely that the employer provided no suitable space, is applied to *Drucker* case, the *ratio* of which does not contain the predicate 'suitable space'. However, on finding that the facts of *Drucker* case satisfy this rule also, *Drucker* can be used to support the argument for *Weissman*.)

We should note that our approach to precedent retrieval is perhaps less efficient than a dimension-based approach. However, we feel that this is the cost one must pay for being able to model creative arguments. In a practical system, one may wish to use a hybrid approach with the dimensions being used for quick access, but provide an option to switch to the slower module for generating creative arguments, if required.

We are implementing our model using the blackboard architecture (Erman *et al.* 1980, Nii 1986), for it is ideally suited for a mixture of top-down and bottom-up control with multiple levels, and the shell for it is commercial available (GBB system from the Blackboard Technology Group).

6 An Example

We now illustrate some aspects of our approach by showing how Ex. 1 from Sec. 2.1 can be modeled. Fig. 1 shows the facts of *Weissman*, which is the new case.

The case-base includes *Cousino* and *Drucker*. Fig. 2 shows a partial representation of the facts and *ratio* of the *Cousino* case. For easier understandability, we do not show all the facts, all the nodes corresponding to the displayed facts, or all the links between the displayed nodes. For example, the links *carried-out-at* connecting tasks to the places where they are carried out are not shown. Also, we do not show in the figure the semantics of displayed categories. For instance, the semantics of *suitable-space-for* — "a place P is a *suitable-space-for* a task T, if T's *requirements-for-place* attributes are either included in P's *attributes*, or can be derived from them" — is not shown in the figure.

Weissman Case Facts

trade: *college professor*
 employee: *city college*
 expected-tasks: *teaching (lecturing, preparing lessons, grading, meeting with students), research (finding reference material, reading, thinking, writing)*
 employee-provided-space: *classroom, library, office*

TASK FRAMES

task-name: *teaching*
 rel-importance: *high*
 rel-time-spent: *20%*
 carried-out-at: *classroom*
 requirements-for-place: *large, at school*

task-name: *research*
 rel-importance: *High*
 rel-time-spent: *80%*
 carried-out-at: *home office*
 requirements-for-place: *quiet, safe for keeping research and writing material*

PLACE FRAMES

place-name: *home office*
 rel-time-spent: *80%*
 attributes: *quiet, private, safe for keeping research and writing material*
 activities-carried-out: *research*
 provided-by: *Weissman*
 designated-purpose: *research*

place-name: *classroom*
 rel-time-spent: *10%*
 attributes: *large, at school, has furniture*
 activities-carried-out: *lecturing*
 provided-by: *city college*
 designated-purpose: *teaching*

place-name: *office*
 rel-time-spent: *5%*
 attributes: *shared, has telephone, has furniture*
 activities-carried-out: *meeting with students*
 provided-by: *city college*
 designated-purpose: *preparing lessons, meeting with students, research*

place-name: *library*
 rel-time-spent: *5%*
 attributes: *shared, has reference material, has furniture, quiet*
 activities-carried-out: *finding reference*
 provided-by: *city college*
 designated-purpose: *finding reference, research*

Figure 1: A partial representation of the facts of *Weissman*

trade: *high-school teacher*
employee: *xyz high school*
expected-tasks: *teach, grade papers, prepare lessons, talk to parents*
employee-provided-space: *classroom, staff room*

TASK FRAMES

task-name: *teach*
rel-importance: *high*
rel-time-spent: *70%*
icarried-out-at: *classroom*
requirements-for-place: *large, at school*

task-name: *grade papers*
rel-importance: *medium*
rel-time-spent: *15%*
is-carried-out-at: *home office*
requirements-for-place: *has desk*

task-name: *talk to parents*
rel-importance: *low*
rel-time-spent: *5%*
is-carried-out-at: *home office*
requirements-for-place: *has telephone*

task-name: *prepare lessons*
rel-importance: *medium*
rel-time-spent: *10%*
is-carried-out-at: *home office*
requirements-for-place: *has desk*

PLACE FRAMES

place-name: *home office*
rel-time-spent: *20%*
attributes: *quiet, private, has desk, has telephone*
activities-carried-out: *grade papers, prepare lessons, talk to parents*
is-provided-by: *Cousino*

place-name: *classroom*
rel-time-spent: *70%*
attributes: *large, at school, has furniture*
activities-carried-out: *teachi*
is-provided-by: *xyz high school*

place-name: *staff room*
rel-time-spent: *10%*
attributes: *shared, has telephone, has furniture*
activities-carried-out: *relaxation*
is-provided-by: *xyz high school*

Cousino Case ratio

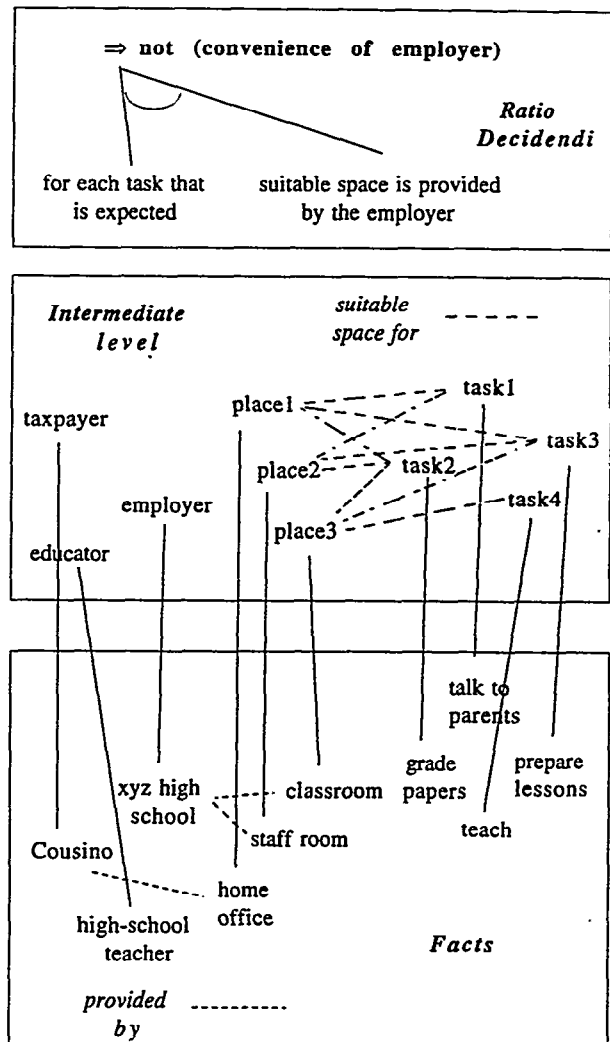


Figure 2: A partial representation of the facts and the *ratio* of *Cousino*

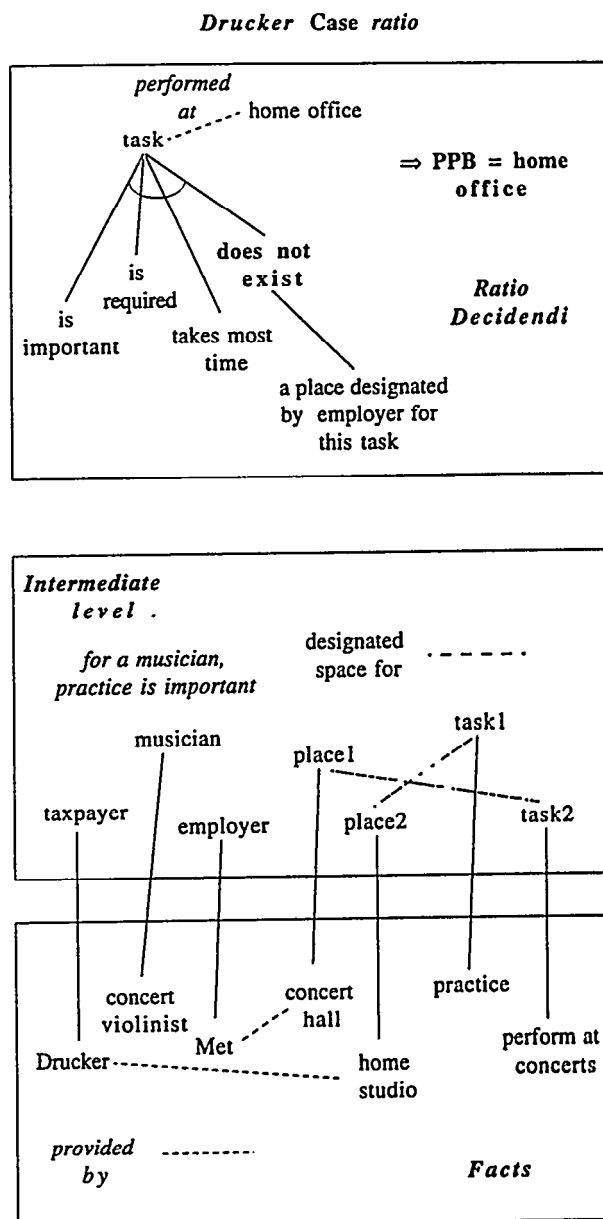
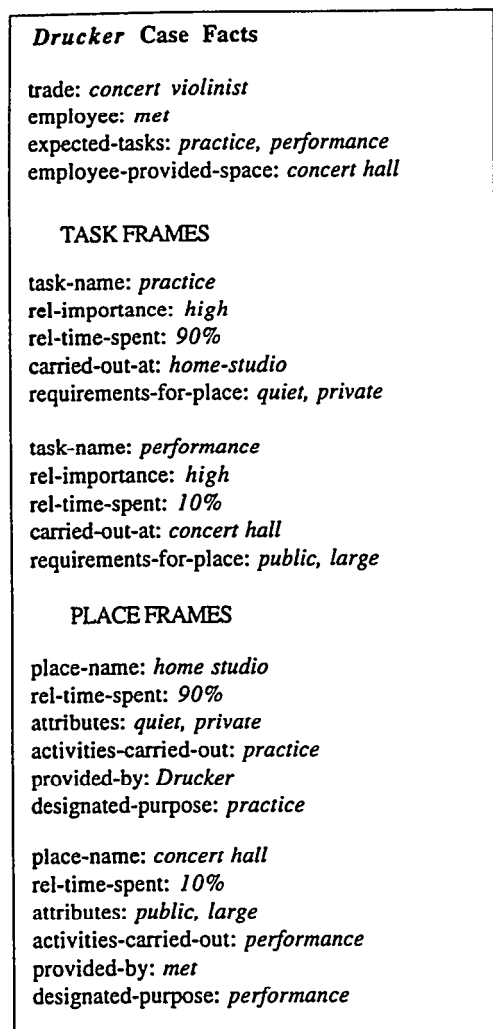


Figure 3: A partial representation of the facts and the *ratio* of *Drucker*

Similarly, in Fig. 3, we show partial representations of the facts and *ratio* of the *Drucker* case.

Now when the *Drucker* case is applied to the facts of *Weissman* (Fig. 1), the resulting representation is shown (partially) in Fig. 4. Notice that *Drucker's* *rational* does not apply to *Weissman* because for each task required by W.'s employer, there exists some place provided by the employer that is designated for this task. However, when *Cousino* is activated, the category *suitable-space-for* comes into play. This category reinterprets *Drucker* as shown in Fig. 5. The category *suitable-space-for* is also applied to *Weissman*, (Fig. 6). With this reinterpretation, *Drucker* and *Weissman* are rendered similar.

Notice that even though *Cousino* itself would support a conclusion against *Weissman*, its category *suitable-space-for* is crucial in reinterpreting *Drucker* and applying it to *Weissman* by rendering them similar.

7 Comparison with Related Research

As we have been pointing out throughout this paper, we have designed our model using many ideas from existing literature and implemented systems. Obviously, we owe a great intellectual debt to Cabaret (Rissland and Skalak 1991) and BankXX (Rissland, Skalak, and Friedman 1996) architectures, for we have been greatly influenced by them. Yet, there are many significant corners where we have taken a different turn: for instance, in how we represent precedents, and how we retrieve them. Though a detailed comparison must be deferred to a later date as both Cabaret and BankXX are fully implemented systems and our ideas are just getting off the drawing board, we would like to mention here some important ways in which our proposed system goes beyond the capabilities of each of the Cabaret and BankXX systems.

It is interesting to note that Cabaret comes rather close to incorporating the aspect of creativity exemplified by Ex. 1 of Sec. 2.1. This example is analyzed at length in Rissland and Skalak (1991) to demonstrate the working of Cabaret. In generating an argument for *Weissman* case, Cabaret finds that a rule that can allow *Weissman* to claim tax-deduction is a near miss: the condition that the home office be the principal place of business is not satisfied. As the conclusion of this rule is the desired goal of the system, it tries to broaden the rule by finding some precedent which is similar to *Weissman*, and where the courts considered the missing condition to be satisfied. As a result, *Drucker* is retrieved, which is seen similar to *Weissman* in that in both the home office was the primary-responsibility location, and was necessary to perform employee's assigned duties.

Here Rissland and Skalak argue that this step of Cabaret closely reflects the court's argument: "The commissioner attempts to distinguish *Drucker* on the ground that the employer there provided no space for practice, while here the employer provided some space, i.e. a shared office and a library. *Drucker* is not so easily distinguished, however, for there, as here, the relevant fact is that the employer provided no *suitable* space for engaging in necessary employment-related activities." (quoted on pp. 869-870 of Rissland and Skalak, 1991; emphasis court's). However, we would argue that Cabaret does not really model the argument in this quote, for, as far as we can determine, it does not have the dimension 'employer-provided-space' in its knowledge base. To model this argument faithfully, a system has to be able to note that *Weissman* can be distinguished from *Drucker* along the 'employer-provided-space' dimension, and

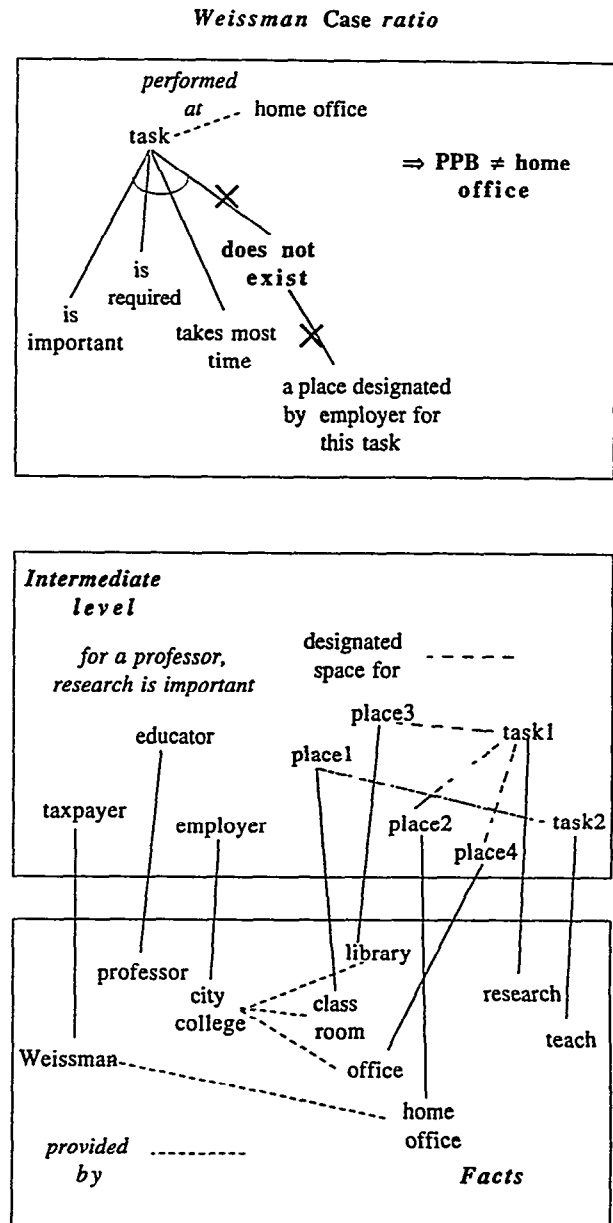
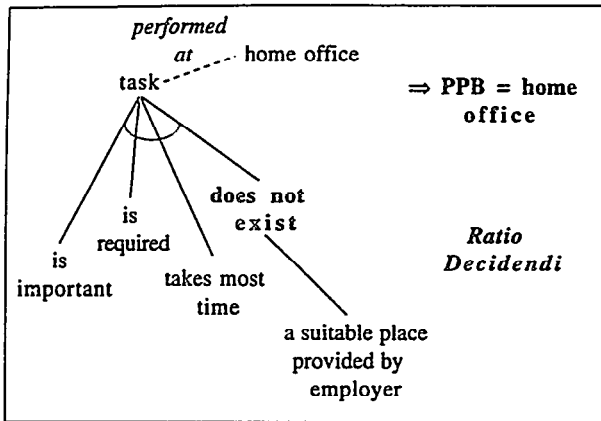


Figure 4: Applying *Drucker* to *Weissman*

Drucker Case ratio



Weissman Case ratio

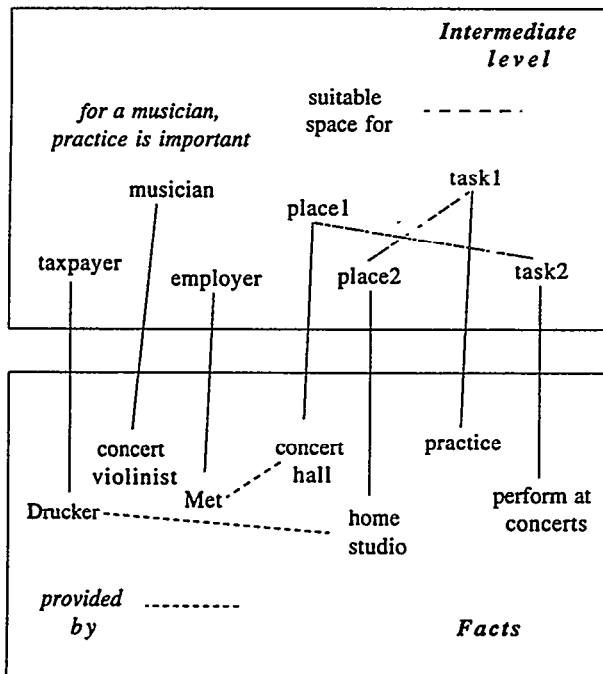
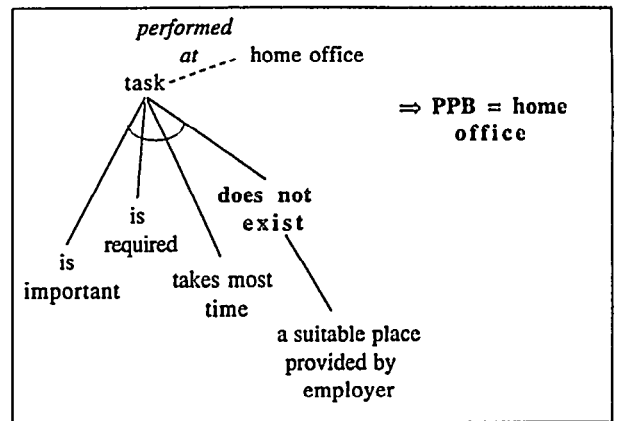


Figure 5: Effect of Cousino in reinterpreting Drucker.

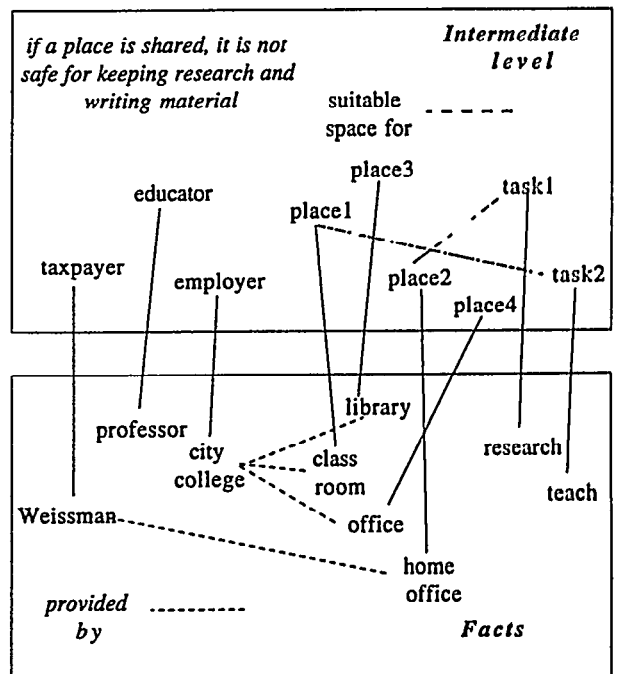


Figure 6: Reinterpreted Drucker applied to Weissman.

then find out that if this dimension is changed to 'employer-provided-suitable-space', the distinction disappears. This point may be subtle, but we feel that in capturing it lies the crux of modeling creativity.

In comparing our system with BankXX, we would like to note that, again as far as we can determine, BankXX cannot model the kind of reinterpretation illustrated in Figs. 5 and 6. While it uses a complex representation scheme with multiple spaces (one of which contains legal theories), a sophisticated search algorithm that exploits many kinds of inter- and intra-space links to generate 'argument pieces', and several different ways to determine and evaluate how an argument piece can support a certain desired conclusion for the new case; the cases in the case-base themselves are not reinterpreted during processing. For this reason, we believe that our approach extends the argument-generating capability of a system like BankXX in an important way.

There are also other systems that address the problem of multiple interpretations. For example, in the dialectical reasoning system of Poulin *et al.* (1993) and St.-Vincent *et al.* (1995), all foreseeable interpretations of the statutes are encoded in the system, and a filtering mechanism is provided for choosing appropriate interpretations depending on the goals of the user. Hamfelt (1996) proposed a multi-level first-order formalism for representing legal meta-knowledge necessary for generating multiple interpretations. However, the focus of our research is somewhat different, as we are interested in modeling the process of generating novel, unforeseeable interpretations.

8 Conclusions and Future Research

In this paper we have analyzed the problem of modeling creativity in legal reasoning, and outlined a blackboard architecture for it. The architecture is based on a synthesis of existing approaches in legal reasoning, with an added mechanism that allows cases already existing in the case-base to be reinterpreted. The basic idea is to represent the facts and the *ratio* of each case in the case-base. When a case is activated, the categories used in its *ratio* are made available for reorganizing the new case as well as any other case that is currently being considered for being applied to the new case. As a result of this interaction, the facts of the cases already existing in the case-base (and that are being applied to the new case) can be reinterpreted, and novel arguments for the new case can emerge.

We emphasize once more that this research is still in its infancy, as we have just started to build our system based on the ideas outlined here. Needless to say, still much work remains to be done in implementing and testing our system.

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