Representing legal precedents as defeasible–argumentation structures (preliminary report)

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Abstract. These notes discuss how logical systems for defeasible argumentation can be used for representing the content of legal precedents and for modelling case–based reasoning in law. In particular, we will use our own system, which not only evaluates competing arguments, but also formalises debates on the comparison of those arguments. Our analysis will nevertheless apply to other argumentation systems with similar features.
We will first discuss how the language of our system can be used to refine factor–based representations of legal precedents, i.e., those representations which focus on how facts contribute to the decision in a case. In particular we will propose a representation method which makes it possible to express why certain factors were outweighed by other factors. This method generalizes and refines some aspects of case formalizations originally implemented in systems specifically devoted to case analysis, such as the HYPO system of Ashley and Rissland. Then we will discuss how such representations can be used in a dispute where the parties have HYPO–style argument moves available.
We hope that our discussion shows how logical work on defeasible argumentation relates to case–based features of legal argument, so far considered to fall outside the province of logic.

1 Introduction

The analysis of judicial decision is a central problem of legal methodology as well as in legal applications of AI. Within AI & law, factor–based models have been most popular in modelling case–based reasoning (for a general introduction to case based reasoning in law, see Ashley 1993). Those models combine a so called interest–oriented (or sociological) approach to legal reasoning, according

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to which legal decision is a choice based on a comparative evaluation between competing interests, and the common law view of law application, according to which new cases are (and must be) decided in accordance with previous one. The underlying assumption is that lawyers usually agree on the pro or con relevance of a factor, but disagree on the resolution of the factors, and use authoritative past cases to justify factor resolution in new cases.

Therefore, in such models every precedent case is represented as a set of factors, which push the case towards (pro) or against (con) a certain decision, plus a decision which resolves of the conflict between the competing factors; new cases are expected to be resolved in accordance with decisions performed in the past. HYPO [Ashley 90], in particular, produces arguments which cite cases in favour of the pro and con sides, those cases being selected according to their utility to support the position of each side. We now briefly outline the main features of HYPO.

Representing and reasoning with cases in HYPO

In a dialectical context with two parties, one defending a claim and the other denying it, HYPO determines for each side which are the best case to cite in response to the opponent's move. A best case for a side is a case that:

- shares with the current situation at least one factor with favours the side for which it is cited.
- shares a most inclusive set of factors with the current situation, in comparison with other cases confirming the desired decision (on pointness);

A citation can be countered by a counterexample, that is a case that is at least as much on point, but has the opposite outcome. A citation may also be countered by distinguishing, that is by indicating a factor in the Current Fact Situation (CFS) which is not present in the cited precedent, and which supports the opposite outcome of that of the cited case.

In choosing an appropriate argument move, a crucial aspect is the tendency of facts towards or against a decision. Consider the following example, where the issue is whether a stay in another country changes one's fiscal domicile with respect to income tax. Assume that we can identify the following factors pro and con.

- Pro change is that the old house was given up, while con change is that it was kept.
- Pro change is that the tax payer's employer is based in the new country, while con change is that the employer is based in the old country.
- Pro change is that the duration of the stay is long, while con change is that the duration is short.[3]

[3] For simplicity we will in this paper assume, unlike HYPO, that all factors are twovalued, i.e. either true or false.

Now suppose we have the following two precedents (note that we do not assume that each factor receives a definite value in each case: the duration may be neither long nor short, so that it does not push the decision in neither direction).

Prec A: Factors: long duration, domestic employer; gave up house
Decision: change

Prec B: Factors: foreign employer, kept house
Decision: change

Prec C: Factors: short duration, domestic employer, gave up house
Decision no change

Assume that the facts of a new case (the CFS) are:

CFS: long duration, domestic employer, kept house

All precedents share some factors with the new case:

Prec A $\cap$ CFS = { long duration, domestic employer }
Prec B $\cap$ CFS = { kept house }
Prec C $\cap$ CFS = {domestic employer }

Suppose that Side 1 in the new case wants to argue that also in the CFS the fiscal domicile has changed. Although both Prec A and Prec B have this outcome, B is not citable for Side 1 since the only factor it shares with the common situation is against change. Only A is can be cited by Side1. Side 2 can only answer to the citation of A by distinguishing, that is by referring to the factor kept, which is a no change factor in the current situation not shared by Prec 1.

In evaluating the force of the moves HYPO uses the set inclusion ordering on the factors that the precedents share with the CFS. For instance, if in the above CFS a party cites Prec C in defence of the claim 'no change', then the other party can distinguish C with respect to the factor 'long duration', by drawing an analogy with the 'trumping counterexample' Prec A. The citation of A is regarded as better ('more on point') than that of C, since A shares more factors with the CFS than C (wrt set inclusion).

Note that HYPO's reasoning forms (citing cases, citing counterexamples, distinguishing) are not only based on the set inclusion ordering on the shared factors with the CFS, but also on the tendency of the factors toward a certain outcome. A case is useful (citable) for a side only if this case and the current situation share a factor favouring that side, and a case can be distinguished only if the distinguishing factor is against the outcome of distinguished case. Therefore, in representing precedents it is essential that this tendency of factors is somehow represented. HYPO does so by simply marking them Pro or Con the decision. In this paper we will propose an alternative method.

The need for extending HYPO's model

HYPO's model is quite attractive, since it emphasizes the dialectical nature of legal reasoning while reducing it to a limited set of argument moves, based on a simple knowledge representation scheme. However, it is has frequently been observed that HYPO's way of representing cases is still too coarse, since it has no way of representing how facts contribute to a decision. Cases are represented essentially as a collection of factors, and a decision; no intermediate reasoning steps from factors to decision can be represented. Therefore HYPO does not do justice to the typical stepwise construction of legal arguments, in which subordinate questions need to be answered in order to get to the final outcome of the case.

[Branting 94] has proposed a way to overcome this limitation. He essentially represents the ratio decidendi of precedents as a logical argument, i.e. as a logically valid sequence of reasoning steps starting from a set of premises. With this method he can represent that the factors used in the previous example result from more basic factors. For example, if the house is sold or rented for a long period, then it is not kept, if the employer has a foreign nationality, or owns a separate production or administration unit in the country where the worker is supposed to go, it is a foreign employer, and so on.

Although thus Branting's model overcomes a limitation of HYPO, it gives up one fundamental aspect of HYPO's approach, its dialectical nature. Note that this character not only concerns the last reasoning step, but every previous passage. For example, in relation to the domestic nationality of the employer, the fact that he has national citizenship is pro, while the fact that he has foreign headquarters is con, in relation to the keeping of the house, the factor house–sold is against, house–long–term-rented is con, while house-short–term–rented is pro, house–empty is pro, and so on.

Our proposal: the basic idea

To preserve the strong points of both HYPO and Branting's model, we will in this paper propose to represent precedents not just as one logical argument but as a set of possibly conflicting arguments, including arguments on the comparative evaluation of other arguments. Those 'priority' argument will make it possible to express why certain factors were outweighed by other factors. This method does justice to both HYPO's and Branting's models: each precedential argument may include multiple steps (as Branting suggest), but the conclusion derived in each of those steps may be the matter of a dispute in which factors pro and con that conclusion are resolved (as HYPO would do).

2 Logical preliminaries

The logical system used in this paper is the one of [Prakken & Sartor 96a] (although other systems with similar features will do as well). We will here recapitulate only its bare essentials. The language of the system is that of extended

logic programming. i.e. it has both negation as failure and classical negation (but in this paper we will not use negation as failure). We add to this language one feature: each formula of this language is preceded by a term, its name. Rules can be *strict*, represented with $\rightarrow$, or else *defeasible*, represented with $\Rightarrow$. The idea is that strict rules are beyond debate; only defeasible rules can make an argument subject to defeat. The input information of the system, which we call an *ordered theory*, is a pair (S, D) where S is a set of strict rules and D a set of defeasible rules.

Arguments can be formed by chaining rules, while conflicts between arguments are decided by utilising priorities that are defined on the rules, and which induce a binary relation of *defeat* among arguments. An important feature of our system is that information about these priorities is itself presented as premises in the logical language, so that debates about priorities are formalised in the same way as debates about any other matter.

The relation of *defeat* is intended to be a weak notion: intuitively 'Arg_1 defeats Arg_2' means that Arg_1 and Arg_2 are in conflict and that Arg_1 is not worse than Arg_2. This means that two arguments can defeat each other. If Arg_1 is, moreover, better than Arg_2, this implies that Arg_2 does not defeat Arg_1. Then we say that Arg_1 *strictly defeats* Ag_2.

Finally, in terms of the defeat relations between pairs of arguments, the system divides all arguments that are possible on the basis of a given ordered theory, into three classes: the *justified* arguments, those with which a dispute can be 'won', the *overruled* arguments, with which a dispute should be 'lost', and the *defensible* arguments, which should leave the dispute undecided.

In representing the tendency of facts towards decisions, we will use the fact that logic–programming rules are one–directional. We intend to read a rule

$$r : antecedent \Rightarrow consequent$$

as 'the antecedent is a reason pro the consequent'. One consequence of this reading is that the antecedent cannot be decomposed into other reasons for the consequent: if we say[4]

$$r : (p \wedge q) \Rightarrow d$$

i.e. that $p \wedge q$ is a reason pro d, we do not say that p and q are reasons for d. Likewise, if we say

$$r_1 : p \Rightarrow d$$

and that

$$r_2 : q \Rightarrow d$$

i.e. that p and q are reasons for d, we do not say that

[4] Propositional atoms are in this paper abbreviations of first–order atoms.

$r_3 : (p \wedge q) \Rightarrow d.$

A counterexample: it can be that rain and heat are reasons not to go running, but that the combination of rain and heat is so pleasant that it is instead a reason to go running.

Note that here we deviate from HYPO, in which the combination of factors pro or con is always a factor with the same tendency. We think that in general this assumption cannot be made.

Finally, for the same reasons we think that even if two reasons pro are together also a reason pro, the priority of the combined rule is in general independent of the priorities of the individual rules.

3 A method for representing cases

Above we said that we will represent precedents as collections of, possibly conflicting, arguments. In fact we will for notational convenience present them in a slightly simpler way, viz. as sets of rules from which the arguments pro and con can be constructed. The precise method is as follows.

According to our reading of reason statements, we will not express the fact that the pro factors outweigh the con factors by mixing pro and con reasons in an antecedent, and joining them with a simple conjunctions. We prefer a representation which directly expresses the tendency of each factor, and the resolution of their conflict. The simplest of such formalizations consists in representing separately each reason statement, and add one or more rules on their comparative evaluation.

For example, let us assume that a short duration of the working stay outweighs the fact that the employer is foreign. We do not express that by a combined rule

r: $Short\_duration \wedge foreign\_employer \Rightarrow \neg change\_fiscal\_domicile$

Instead, we will represent the resolution of a conflict between factors as a pair of conflicting rules, together with a priority statement.

r_1: $short\_duration \Rightarrow change\_fiscal\_domicile$
r_2: $foreign\_employer \Rightarrow \neg change\_fiscal\_domicile$
r_3: $antecedent \Rightarrow r_2 \prec r_1$

$r_2 \prec r_1$ means that r_2 has priority over r_1. $antecedent$ expresses the conditions under which $short\_duration$ outweighs $foreign\_employer$ (as far as a change is fiscal domicile is concerned.) In realistic examples $antecedent$ will itself often be derived (dialectically!) from other rules.

It is important to note that the priority statements can be based on any ground, ranging from general legal principles to case–specific considerations. It is not necessary (although possible) that they reflect certain general legal

principles, like 'higher courts precede lower courts' or 'later decisions prevail over earlier ones'. It can also express HYPO's 'more–on–point' ordering of cases, as will be explained later. And the priorities can very well depend on considerations that are specific to the context of a case, as is often the case in applications of HYPO. For instance, in cases concerning misuse of trade secrets they could be based on the expected consequences that awarding a claim would have for the further existence of a company.

4 The dialectical context

Just defining a representation method in a logical language is not enough; we must also specify the dialectical context in which the represented information can be used. This will be done in the present section. Our idea is to embed the method in the dialectical proof theory that has been developed in [Prakken & Sartor 96b] and [Prakken 96] for our argumentation framework. For the technical details the reader is referred tot the latter paper, which is also contained in the present workshop notes. In short, the idea of the proof theory is that a proof of a formula takes the form of a dialogue tree, where each branch of the tree is a dialogue, and the root of the tree is an argument for the formula. Every move in a dialogue consists of an argument based on some given ordered theory. The essence of the proof theory is that each stated argument attacks the last move of the opponent in a way that meets the player's burden of proof. The required force of a move depends on who states it. Since the proponent wants a conclusion to be justified, a proponent's move has to be strictly defeating, while since the opponent only wants to prevent the conclusion from being justified, an opponent's move may be just defeating.

The proof theory is defined relative to an arbitrary but fixed ordered theory. In [Prakken & Sartor 96b, Prakken 96] we remarked that although thus the parties in a dispute are restricted to using rules from a given 'pool' of premises, this is just a theoretical restriction; the definitions equally apply if it is assumed that the pool of premises consists of everything put forward by the players in a dialogue.

Now the idea of this section is to make this assumption more precise. More specifically, we want to regard a HYPO–style protocol for argumentation as a set of restrictions on the ways in which parties can enter new material into the dispute: not all statements can be introduced but only those that come from certain sources (notably precedents) or are based on these sources in certain ways (viz. by way of analogizing or distinguishing a precedent).

Thus we hope that certain of HYPO's moves come out as special cases of allowed moves in our protocol, and that on certain other points our protocol generalises, revises or refines HYPO's analysis.

Let us first repeat the central definition of the dialectical proof theory ('Arg–defeat' means defeat on the basis of the priorities stated by Arg).

Definition 1. A *priority dialogue* is a finite nonempty sequence of moves $move_i = (Player_i, Arg_i)$ $(i > 0)$, such that

1. $Player_i = P$ iff i is odd; and $Player_i = O$ iff i is even;
2. If $Player_i = Player_j = P$ and $i \neq j$, then $Arg_i \neq Arg_j$;
3. f $Player_i = P$ then
   - Arg_i strictly Arg_i–defeats Arg_{i-1}; or
   - Arg_{i-1} does not Arg_i–defeat A_{i-2};
4. If $Player_i = O$ then Arg_i $\emptyset$–defeats Arg_{i-1}.

A player *wins* a dialogue iff the other player cannot move.

The first condition says that the proponent begins and then the players take turns, while the second condition prevents the proponent from repeating its attacks. The last two conditions form the heart of the definition: they state the burdens of proof for P and O.

Next we formally define the notion of a precedent.

Definition precedents *A* precedent *is a pair (CaseFacts,CaseRules), where*

- *CaseFacts is a set of strict rules;*
- *CaseRules is a set of rules.*

If Cases is a set of precedents, then Rules–of(Cases) is the union of the sets CaseRules of all precedents in Cases.

Note that a precedent is just an ordered theory, so it can serve as input information of our argumentation framework: in particular, the arguments that are possible on the basis of a case C can be classified as justified, defensible, or overruled on the basis of C.

Let us now define the 'background information' of the protocol. This should not be confused with the ordered theory of our system for defeasible argumentation: the background information is the information from which the input theory can be (dialectically) constructed by the parties.

Definition Background Information *A Background Information theory (BI) is a triple (Cases,CFS,CSRules), where*

- *Cases is a set of precedents;*
- *CFS is a set of strict rules, the current fact situation;*
- *CSRules is a set of rules, the common sense knowledge.*

Now as a first approximation the idea is that each move of the players should consist of only rules from Rules–of(Cases) $\cup$ CFS $\cup$ CSRules (obviously, the facts of a precedent may in a new fact situation not be used). However, to capture HYPO's analysis, we must also allow for the introduction of rules that are not contained in any of these sets, but that can be obtained by analogizing or distinguishing a precedent. In the present paper we will not formally define when that is the case, but confine ourselves to discussing some examples, and assume that a proper definition can be given. We just add to Definition 1 the following condition:

(5) Of each move, all rules are introducible *on the basis of BI.*

Note that thus Definition 1 is relative to an implicitly assumed Background Information theory.

As will be apparent from our examples, formalising HYPO's notions of analogizing and distinguishing is easy, but it might be that our extended representation method makes more refined forms of these reasoning patterns possible. This has to be left for future research.

The definitions of our dialectical proof theory can now be used for determining who wins a dispute. This is the case when the other party has run out of moves. Note that thus the outcome is relative to the rules that have actually been put forward by the parties; it is perfectly possible that an outcome might have been different if a party had made more (or less) clever use of the background information. To see who can win if both parties use the BI in the best possible way, we must consider a dialogue tree, as defined by [Prakken & Sartor 96b, Prakken 96].

Definition 2. A *dialogue tree* is a finite tree of moves such that

1. Each branch is a dialogue;
2. If $Player_i = P$ then the children of $move_i$ are all defeaters of Arg_i.

A player *wins* a dialogue tree iff it wins all branches of the tree.

Consider now for any BI the ordered theory T consisting of the union of Rules–of(Cases) CFS, CSRules, and the set of all rules that are introducible on the basis of BI. Then we can say that P has a winning strategy for claim C on the basis of BI iff there is a provably justified argument for C on the basis of T, i.e. iff there is a proof tree on the basis of T won by P and with as root an argument for C. And O has a winning strategy iff all proof trees for C on the basis of T are won by O.

5 Illustration

In this section we will illustrate the use of our representation method in the dialectical context. For notational convenience we will often list the facts of a case as a literal or a sequence of literals, preceded by f. Formally, a fact p_i with name f_i is a strict rule $f_i{:} \rightarrow p_i$.

First we will illustrate how some of HYPO's notions come out as special cases of our analysis. Note that HYPO's cases concern only one decision. However, our method of representing cases as argument structures makes that cases often contain multiple decisions. We think that HYPO's definitions (for instance, the 'more on point' relation) can best be understood as applying to each of those individual decisions. This is what we will assume below.

We will make use of a BI that extends and somewhat modifies our tax example, and that makes use of the following factors.

Factor:	*supported conclusion:*
f_1: kept–house	¬ change
f_2: ¬ kept–house	change
f_3: domestic–company	¬ change
f_4: ¬ domestic–company	change
f_5: short–duration	¬ change
f_6: long–duration	change
f_7: domestic–property	domestic–company
f_8: ¬ domestic–property	¬ domestic–company
f_9: domestic–headquarters	domestic–company
f_{10}: ¬ domestic–headquarters	¬ domestic–company
f_{11}: ¬ domestic–job prospects	change
f_{12}: foreign–car	change

Note that we have a little complicated the example, by introducing an intermediate factor, that is domestic–company, which is to be established on the basis of other factors.

The precedential knowledge base Cases consists of four cases.

$A = \{r_{1/4/6}(a)$: ¬ kept–house ∧ ¬ domestic–company ∧
long–duration ⇒ change
f_1: ¬ kept–house, f_4: ¬ domestic–company, f_6: long–duration $\}$

A is a simple case, with no factors con its decision. It contains the justified argument $[f_1, f_4, f_6, r_{1/4/6}(a)]$ for 'change'.

$B = \{r_7(b)$: domestic–property ⇒ domestic–company
$r_{10}(b)$: ¬ domestic–headquarters ⇒ ¬ domestic–company
$r_4(b)$: ¬ domestic–company ⇒ change
$r_2(b)$: kept–house ⇒ ¬ change
$p_1(b)$: ⇒ $r_7 \prec r_{10}$
$p_2(b)$: ⇒ $r_2 \prec r_4$
f_2: kept–house, f_7: domestic–property, f_{10}: ¬ domestic–headquarters $\}$

B illustrates the stepwise construction of a decision. It contains the justified argument $[f_{10}, r_{10}(b), r_4(b)]$, which supports its intermediate conclusion '¬ domestic–company' and its final decision 'change'.

$C = \{r_1(c)$: ¬ kept–house ⇒ ¬ change
$r_{3/5}(c)$: domestic company ∧ short–duration ⇒ ¬ change
$p_3(c)$: ⇒ $r_1 \prec r_{3/5}$
f_1: ¬ kept–house, f_3: domestic–company, f_5: short–duration $\}$

C contains the justified argument $[f_3, f_5, r_{3/5}(c)]$ for '¬ change'.

$D = \{r_{1/11/12}(d)$: ¬ kept–house ∧ ¬ domestic–job–prospects ∧
foreign–car ⇒ change
$r_{3/5}(d)$: domestic–company ∧ short–duration ⇒ ¬ change
$p_4(d)$: ⇒ $r_{3/5} \prec r_{1/11/12}$
f_1: ¬ kept–house, f_3: domestic–company, f_5: short–duration,
f_{11}: ¬ domestic–job–prospects, f_{12}: foreign–car }

D contains the justified argument $[f_1, f_{11}, f_{12}, r_{1/11/12}(a)]$ for 'change'.

CSRules contains just one rule, which expresses the 'more–on–point' ordering on cases. As explained above, that one case is more on point than another means that it is more similar to the current fact situation than the other case. In HYPO this is defined in terms of the set inclusion on the sets of factors shared with the CFS.

In our framework this ordering can be expressed by way of the following rule:

mop: More–on–point$(x, y) \Rightarrow x \prec y$

We will assume that instantiated antecedents of this rule are come from some external procedure that verifies HYPO's definition of more on point cases.

We will now illustrate how this Background Information theory can be used in HYPO–style. With a HYPO–style citation of a precedent two situations must be distinguished, as to whether the precedent does or does not contain factors missing in the CFS. If it does not, the citation can use rules that are in Rules–of(Cases), but if it does not, the citation has to introduce new rules into the dispute. Let us illustrate this with the following dialogue, based on the CFS

{ f_1: ¬ kept–house, f_3: domestic–company, f_5: long–duration,
f_{11}: ¬ domestic–job–prospects }

The proponent wants to defend 'change' and starts the dispute by drawing an analogy with A. Although A does not exactly match the CFS, the citation does not introduce a new rule; it just uses the 'pro' rule of A (below we will leave the facts of an argument implicit).

P_1: $r_{1/4/6}(a)$: ¬ kept–house ∧ ¬ domestic–company ∧
long–duration ⇒ change

The opponent can distinguish this precedent with respect to factor 'domestic–employer', by drawing an analogy with C. Also this citation does not require the introduction of new rules: it just uses $r_{3/5}(c)$.

O_1: $r_{3/5}(c)$: domestic company ∧ short–duration ⇒ ¬ change

According to our framework, O_1 defeats P_1, since it has a contradicting conclusion, and no priorities are stated which would make O_1 than P_1. So O has satisfied its burden of proof.

Now P must attack O_1 with an argument that strictly defeats it. It can do so by citing D. However, this citation involves the introduction of a new rule: since $r_{1/11/12}(d)$ has an antecedent which lacks in the CFS, viz. 'foreign–car', P must broaden this rule into $r_{1/11}$. So one way in which a new rule is 'introducible' is by broadening a rule from Rules–of(Cases). Moreover, to make its argument strictly defeating O_1, P has to state that its rule is based on a more–on–point precedent.

P_2: $\{r_{1/11}(d)$: $\neg$ kept–house $\wedge$ $\neg$ domestic–job–prospects $\Rightarrow$ change
$p_5(cfs)$: $\Rightarrow$ More–on–point$(r_{3/5}(c), r_{11/12}(d))$
$mop(cfs)$: More–on–point$(r_{3/5}(c), r_{11/12}(d)) \Rightarrow r_{3/5}(c) \prec r_{11/12}(d)$

According to our framework, P_2 P_2–defeats O_1 and is, on the basis of the rules introduced in this dialogue, a justified argument. It is left to the reader to verify whether P also has a justified argument on the basis of the Background Information.

6 Refining HYPO

In the foregoing we showed how some aspects of HYPO could be modelled in our framework. Now will discuss how our analysis can be used to extend and revise HYPO's features. First it is possible to identify more ways of distinguishing a precedent. In HYPO this can only be done by citing another precedent with the relevant factor. However, it could also be done by just saying that a CFS lacks a factor which is known to be relevant for the defended claim. For this purpose we could for each factor add a rule r: *factor* $\Rightarrow$ *decision* to CSRules. For instance, for f_1 the rule would be

r_1: kept–house $\Rightarrow$ $\neg$ change

A distinguishing argument could use this rule without referring to a precedent that contains this factor.

Above we showed how in our approach the more–on–point ordering on precedents could be used. However, this ordering is only one possible view on the relation between two precedents. If for some other reason a party regards a less–on–point case as superior to a more–on–point case, then in our system that party can express this view by stating a conflicting priority argument. This cannot be done in HYPO, since it hardwires the more–on–point ordering in the system.

Our method also makes it possible to cite precedents in support for an outcome opposite to the one it actually had (a possibility that was also observed by [Berman & Hafner 91, p.17]). For instance, in the CFS

$\{$ f_1: $\neg$ kept–house, f_3: domestic–company $\}$

A party who wants to argue for '$\neg$ change' can cite A for its opposite outcome, by using $r_3(a)$.

Finally, another possibility is that we can, like [Branting 91]'s GREBE system, model the combining of portions of several precedents in a new argument. Because of space limitations we will not expand on this here.

7 Related research

Our overview of related research has to be brief. To our knowledge the first logical analysis of case–based reasoning in law was [Loui et al. 93], which was further developed in [Loui & Norman 95], which paper analyses the use of rationales in legal argument. The main addition is an embedding in a dialectical setting, which was a source of inspiration for the present paper. Also our idea to represent cases as a collection of possibly conflicting arguments was inspired by [Loui & Norman 95], which uses the method in formalising a certain type of rationale of precedents, a so–called 'disputation rationale'. The idea is that a party who wants to attack the use of a certain precedent, can do so by arguing that the ratio decidendi of the precedent was in fact the result of a choice between conflicting arguments, and that in the new fact situation the outcome of the dispute would have been different.

[Hage 96] gives, in the context of his 'reason–based logic' a representation method for cases that is similar to ours in that it separates the reasons pro and con and expresses the resolution of their conflict in the representation language. However, his method is not embedded in a dialectical context.

8 Conclusion

Concluding, we can ask what has been gained by our reformulation of a HYPO–like analysis in logical form. We think we have gained a number of things. Firstly, we have been able to suggest some refinements and adjustments of HYPO's architecture. Moreover, we have seen that several of HYPO's features are a special case of a more general theory of defeasible argumentation. This has two benefits: firstly, it illuminates and clarifies these aspects of HYPO (we hope), and secondly, it enables the application of HYPO–like methods in domains similar to but not equal to legal reasoning; without embedding HYPO in a more abstract theory such similarities between different domains might remain hidden.

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