

Toward a Computational Theory of Arguing with Precedents: Accommodating Multiple Interpretations of Cases*

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Abstract

This paper presents a partial theory of arguing with precedents in law and illustrates how that theory supports multiple interpretations of a precedent. The theory provides succinct computational definitions of (1) the most persuasive precedents to cite in the principal argument roles and (2) the most salient aspects of the precedents to emphasize when citing them in those roles. An extended example, drawn from the output of the HYPO program, illustrates the range of different descriptions of the same precedent that are supported by the theory. Each description focuses on different salient aspects of the case depending on the argument context.

1 Introduction

This paper presents a partial theory of arguing with precedents in law and illustrates how that theory supports multiple interpretations of a precedent.

The theory provides computational definitions regarding the roles that precedents play in legal argument. Specifically, succinct definitions are provided regarding:

- Relevant similarities and differences among cases
- Most analogous precedents

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- Roles of precedents in arguments as Cited Cases, Distinguished Cases, Counterexamples and Targets for Hypotheticals.

For each argument role, the theory provides definitions of the best precedents to cite and the features of a precedent that are salient when cited in that role. In an extended example, we illustrate how the definitions of salience focus on different aspects of a precedent depending on the facts of the problem situation, the role the precedent plays in an argument, and the side for whom the precedent is cited. The theory also provides rudimentary criteria for evaluating opposing precedent-citing arguments.

The theory has been derived from the experience of designing and building the HYPO program, an adversarial case-based reasoner described in detail in [Ashley 87a]. In effect, HYPO implements the theory. Rather than describing the procedures by which HYPO performs the computations, however, here we emphasize the theoretical description of legal argument underlying the program. At the end of this paper we show how the computational definitions of precedential argument point to ways of improving the theory to support more abstract interpretations of a precedent.

2 Cases and Factors: Some Definitions

The theory assumes that factors can be identified for a given kind of legal claim. Factors are general collections of facts that tend to favor or hurt the plaintiff's argument. They are stereotypical strengths or weaknesses commonly observed in legal cases involving that claim.

Factors are a kind of expert knowledge. When an expert attorney analyses a problem, he can be said to be determining what legal claims apply to the case and what factual strengths or weaknesses the case evidences for each of those claims. The HYPO program's dimensions are a general framework for representing factors.

Factors have magnitudes to reflect the fact that a particular case may be a more or less extreme example of a factor. Each factor has a range of values over which the magnitude of the factor may range from case to case. The magnitude of a factor should be distinguished from its weight. A factor's weight is some kind of measure of the support it lends to a conclusion that the plaintiff should win a claim.

A factor's weight in an argument is highly contextual and cannot be conveniently summarized in a numerical measure. Moreover, experts differ as to the relative weights of competing factors. For those reasons, the theory does not assign weights to factors *a priori*. Instead, the theory allows the precedents to determine the weights of the competing factors symbolically in light of the arguments about how to decide a particular problem.

In this theory of precedential reasoning, a legal case is treated as a historical collection of factors, each with a particular magnitude, to which some authoritative decision maker (i.e., the judge) has assigned an outcome, either that the plaintiff won or lost a given legal claim.

The following notation will make it possible to describe factors and cases more succinctly.¹ Let:

s \equiv side in a lawsuit, either plaintiff (π) or defendant (δ).

" $OC(c_i) = \pi$ " means the outcome of case c_i was for the plaintiff.

F_s \equiv the set of all factors, f , such that f generally favors side s , either plaintiff or defendant, for example:

F_π \equiv the set of all factors, f , that generally favor plaintiff.

F_δ \equiv $\{f \mid f \text{ generally favors defendant}\}$.

F_{c_i} \equiv $\{f \mid f \text{ applies to } c_i\}$, (i.e., the set of all factors, f , such that f applies to case c_i .)

$Opp(s)$ \equiv opponent of side s , for example, $Opp(\pi) = \delta$, that is, the opponent of plaintiff is defendant.

For a given factor f^k :

$M(f_{c_i}^k)$ \equiv the magnitude of factor f^k in case c_i .

" $M(f_{c_i}^k) > M(f_{c_j}^k)$ " means that the magnitude of factor f^k is greater for the plaintiff in case c_i than in case c_j .

¹This paper employs some symbols from set theory and logic. The following simple examples illustrate the symbols' meanings.

Let's assume that A is the set consisting of the letters a , b , and c , that is, $A = \{abc\}$. Let $B = \{cefg\}$. The intersection of sets A and B is $A \cap B = \{c\}$. The union of sets A and B is $A \cup B = \{abcefg\}$. The set-difference between sets A and B is $A \setminus B = \{ab\}$. $B \setminus A = \{cefg\}$.

Let $E = \{bc\}$. Set E is a subset or equal to A (i.e., $E \subseteq A$) because either $E = A$ or every member of E is a member of A . A is not a subset or equal to E (i.e., $A \not\subseteq E$) because there is at least one member of A , a , that is not a member of E .

Let $G = \{xyz\}$.

Sets A and G are disjoint because the intersection of A and G is the empty set. In symbols, $A \cap G = \emptyset$.

Assume that l_i is a variable that stands for some letter. The expression, $\forall l_i \mid l_i \in A$, means "for all letters, l_i such that l_i is a member of set A ." The expression, $\exists l_i \mid l_i \in A$, means "there exists some letter, l_i , such that l_i is a member of A ."

" \vee " means or. " \wedge " means and.

" \setminus " \equiv set difference.

CKB \equiv set of all past cases in the case knowledge base.

3 Defining Relevant Similarities among Cases

The keystone of a theory of reasoning with legal precedents is a definition of relevant similarities and differences among cases. In arguing that a new case should be decided like an old, the old case must have some similarities that are relevant to the justification. In other words, the similarities must tend to persuade a decision-maker to decide the new case like the old.

Relevant similarities and differences can be defined computationally in terms of factors.

Relevant similarities between two cases are shared factors. The set of relevant similarities, S_{c_1, c_2} between two cases, c_1 and c_2 , is the set of factors the two cases share, specifically:

$$S_{c_1, c_2} = F_{c_1} \cap F_{c_2} \quad (1)$$

In English, the set of relevant similarities between cases c_1 and c_2 is the intersection of the sets of factors that apply to each case.

Intuitively, the relevant similarities are reasons why the two cases should have the same outcome. One case was decided because, or in spite, of the factors that applied to it. At least some of those factors, the ones associated with the relevant similarities, also apply to the other case and justify the same outcome.

The set of relevant differences between c_1 and c_2 , D_{c_1, c_2} , is defined as follows: (Assume that the outcome of c_2 was in favor of plaintiff.)

$$D_{c_1, c_2} \equiv \begin{aligned} &[(F_{c_1} \setminus F_{c_2}) \cap F_\delta] \\ &\cup [(F_{c_2} \setminus F_{c_1}) \cap F_\pi] \\ &\cup \{f \mid (f \in S_{c_1, c_2}) \wedge (M(f_{c_2}) > M(f_{c_1}))\} \end{aligned} \quad (2)$$

In English, the set of relevant differences is the union of three sets, the pro-defendant factors that apply only to c_1 , the pro-plaintiff factors that apply only to c_2 and the shared factors which favor plaintiff more strongly in c_2 than in c_1 .

Intuitively, the relevant differences are reasons why the two cases should be decided differently. All of these relevant differences make c_1 a weaker case for plaintiff than c_2 . As a result, c_2 is a weaker justification in a legal argument that plaintiff should win in c_1 .

4 Most Analogous Precedents

The theory defines two senses in which a precedent is analogous or "on point" to a problem.

Cases that are on point are relevantly similar to a problem situation. The set of cases that are on point to a problem, OP , is defined as follows:

$$OP \equiv \{c_i \mid (c_i \in CKB) \wedge (S_{p, c_i} \neq \emptyset)\} \quad (3)$$

Saying that one case, c_i , is more on point than another case, c_k , means that:

$$S_{p,c_i} \supset S_{p,c_k} \quad (4)$$

In English, the set of relevant similarities between the problem situation and c_i is a superset of the set of relevant similarities between the problem and c_k .

Cases that are most on point to the problem are the most relevantly similar of all the on point cases. The set of most on point cases, *MOP*, is defined as the set of all cases, c_i , such that for each c_i , there is no on point case more on point than c_i . Specifically, *MOP* is defined as follows:

$$\begin{aligned} MOP \equiv & \\ & \{c_i \mid (c_i \in OP) \wedge \\ & (\forall c_k \in OP \\ & ((S_{p,c_i} \cap S_{p,c_k} = \emptyset) \vee \\ & (S_{p,c_i} \supseteq S_{p,c_k}) \vee \\ & ((S_{p,c_i} \not\subseteq S_{p,c_k}) \wedge \\ & (S_{p,c_k} \not\subseteq S_{p,c_i}))))\} \end{aligned} \quad (5)$$

In English, *MOP* is the set of all cases, c_i , such that c_i is on point and for all other on point cases c_k , either c_i and c_k have no similarities in common with the problem situation or c_i is as or more on point than c_k , or neither is more on point than the other.

Intuitively, *MOP* contains the cases that are candidates for the best cases to cite for either side in an argument how to decide the problem. Of all the cases in the CKB, they are closest in that they share with the problem the greatest overlap of factual strengths and weaknesses as represented by factors.

As the definitions of “more on point” and *MOP* indicate, in this theory the relative closeness of two cases to the problem is not defined in terms of the comparative numbers of factors they share with the problem but in terms of the relative overlaps of the sets of factors they share with the problem. A case that has two similarities to the problem may be in *MOP* along with a case that has four similarities as long as the relevant similarities comprise different sets and the smaller set is not a proper subset of the larger.

5 Roles for Precedents in Legal Arguments

According to the theory, a precedent can be employed in four roles in a legal argument, as a:

1. **Cited Case** to justify a legal conclusion that the problem should have the same outcome as the cited case.
2. **Distinguished Case** to respond to an assertion that the problem should have the same outcome as the cited case.
3. **Counterexample** to respond in another way to an assertion that the problem should have the same outcome as the cited case.

4. **Target Case** to motivate a hypothetical modification of the problem that will strengthen or weaken an argument.

In each role, different aspects of the precedent are salient. **Salience** means strikingness or emphasis. An arguer emphasizes different aspects of a precedent depending on his viewpoint, either for the plaintiff or the defendant, and on the context in which he uses the precedent in the argument.

For each of the argument roles, the theory allows a succinct expression of (1) the best cases in the CKB to fill the role as well as (2) the features of a precedent that are salient when used in that role. In the expressions, the following abbreviations are employed: *p* stands for the problem situation, *cc* is the cited case, *dc* is the distinguished case, *cex* is the counterexample and *t* is the target.

The main thing to notice about these admittedly complicated expressions is that in defining the features of a precedent that are salient, the expressions take context into account. They contain terms that reflect the facts of the problem situation, the side on whose behalf one argues, the role that a precedent plays in the argument and the facts of other cases in the CKB. This is the key to the theory’s ability to support multiple interpretations of a given precedent.

5.1 Cited Case

The basic role for precedents in legal arguments are as cited cases. Although any on point case could reasonably be cited in support of a side, some precedents are better to cite than others.

The best cases in the CKB for a side to cite in support of its position are certain most on point cases whose outcomes favored that side and with respect to which there are no better cases for the opponent to cite as counterexamples. The opponent’s better cases, if any, are referred to as trumping counterexamples. More concisely, the set of best cases for a side *s* to cite, *BCC_s*, is defined as follows:

$$\begin{aligned} BCC_s \equiv & \\ & \{c_i \mid (c_i \in MOP) \wedge \\ & (\exists f^i \mid ((f^i \in F_s) \wedge (f^i \in S_{p,c_i}))) \wedge \\ & (TCX_{opp(s),c_i} = \emptyset)\} \end{aligned} \quad (6)$$

In the definition of *BCC_s*, *TCX_{opp(s),c_i}* is the set of trumping counterexamples to c_i that the opponent of *s* can cite. In English, the set of best cases to cite for a side *s* is the set of cases, c_i , such that c_i is a most on point case and c_i shares some factor with the problem that favors side *s* and there is no trumping counterexample to c_i for *s*’s opponent to cite.

A trumping counterexample is a case with the opposite outcome that has all the cited case’s similarities and then some. This kind of counterexample “trumps” the cited case. It is more on point than the cited case because it has more (in the sense of a superset of) relevant similarities to the problem. As such, it is a better,

more persuasive case than the cited case that favors the opponent. More specifically, the set of trumping counterexamples, $TCX_{s,cc}$, that can be cited by a side, s , in response to a case, cc , cited by s 's opponent, is defined as follows:

$$TCX_{s,cc} \equiv \{c_i \mid (c_i \in MOP) \wedge (OC(c_i) = s) \wedge (S_{p,c_i} \supset S_{p,cc})\} \quad (7)$$

In English, the set of all cases that a side s can cite as trumping counterexamples to a cited case cc is the set of all most on point cases, c_i , such that the outcome of c_i favors s and c_i is more on point than cc . The salient features of a precedent playing the role of a cited case are its relevant similarities to the problem situation:

$$S_{p,cc} = F_p \cap F_{cc} \quad (8)$$

In citing a case, an arguer should emphasize these similarities because they justify the same outcome in the problem as in the cited case.

A major difference between arguing with factors and cases and arguing with factors alone can be demonstrated by the fact that a cited case's salient features include not only the shared factors that favor a conclusion that the plaintiff should win but also those that favor a conclusion that the plaintiff should lose. If an arguer only knew factors, but no specific cases, he might argue for a side by emphasizing only factors favoring that side and ignoring factors that did not. With a specific case that combined the competing factors, the arguer has persuasive evidence that the current dispute should be decided the same way as the precedent even though there are competing factors that favor the opposite outcome.

5.2 Distinguished Case

The basic way of responding to a cited case is by distinguishing it. Distinguishing points out the relevant differences between it and the cited case as a way of arguing that the problem should be decided differently.

The best cases for a side s to distinguish are the best cases that the opponent can cite, $BCC_{opp(s)}$.

The salient features of a precedent, dc , that s should emphasize in distinguishing it are the relevant differences from s 's viewpoint between the problem and the distinguished case, $D_{p,dc}$, as defined in expression 2.

5.3 Counterexample

Another way of responding to a cited case is by citing another precedent as a counterexample to it. There are four kinds of counterexamples in this theory. Each kind of counterexample involves a case that is "contrary" to the cited case in the sense that it had the opposite outcome, focuses on a different set of salient features and can be used to disparage the impact of the cited case. The four kinds of counterexamples, expressions defining them and the associated salient features are as follow:

Trumping Counterexample: a contrary case that has more (in the sense of a superset of) relevant similarities to the problem than the cited case. Trumping counterexamples have been defined above in expression 7. The salient features of a trumping counterexample, the ones that a side will emphasize in describing the counterexample, are the extra similarities that it shares with the problem that the cited case does not, specifically:

$$S_{p,ccx} \setminus S_{p,cc} \quad (9)$$

An argument citing a trumping counterexample says, in effect, that when the extra similarities are taken into account, the cited case should not be followed.

Partial Counterexample: a contrary case that has the same set of similarities to the problem as the cited case or some nonempty subset of them. A partial counterexample shows, some what more weakly than a trumping counterexample, that the shared similarities do not always lead to the same outcome as the cited case. The set of partial counterexamples that can be cited by a side, s , in response to a cited case, cc , $PCX_{s,cc}$ is defined as follows:

$$PCX_{s,cc} \equiv \{c_i \mid (c_i \in OP) \wedge (OC(c_i) = s) \wedge (S_{p,c_i} \cap S_{p,cc} \neq \emptyset) \wedge (S_{p,c_i} \subseteq S_{p,cc})\} \quad (10)$$

In English, the set of all cases that a side s can cite as partial counterexamples to a cited case cc is the set of all cases, c_i , such that the outcome of c_i favors s and c_i shares some of the same factors with the problem as cc .

The salient features of a partial counterexample are the similarities that both counterexample and cited case have to the problem, that is:

$$S_{p,ccx} \cap S_{p,cc} \quad (S_{p,ccx} \subseteq S_{p,cc})$$

Boundary Counterexample: a contrary case which is an extreme example of some factor, f^i , that both is a relevant similarity between the problem and the cited case and favored the winner of the cited case. The set of boundary counterexamples that can be cited by a side, s , in response to a cited case cc , $BCX_{s,cc}$, is defined as follows: (Assume that s is the plaintiff and that defendant won the cited case.)

$$\begin{aligned}
BCX_{s,cc} \equiv & \\
& \{c_j \mid (OC(c_j) = s) \wedge \\
& (c_j \in OP) \wedge \\
& (\exists f^i \mid (f^i \in F_{opp(s)}^i) \wedge \\
& (f^i \in S_{p,cc}) \wedge \\
& (f^i \in S_{p,c_j}) \wedge \\
& (M(f_{cc}^i) > M(f_{c_j}^i)))\} \quad (11)
\end{aligned}$$

In English, the set of all cases that a side s can cite as boundary counterexamples to a cited case cc is the set of all on point cases, c_j , such that the outcome of c_j favors s and there is some factor, f^i , such that c_j and cc share f^i with the problem, and the magnitude of f^i in c_j is greater in favor of s 's opponent than in cc .

For a given boundary counterexample, ccx , the salient features are the factor, f^i , of which the counterexample is a more extreme example than the cited case and the relative magnitudes of f^i in the counterexample and the cited case. By emphasizing that the plaintiff won despite that fact that the counterexample was worse for the plaintiff along factor f^i than the cited case, a boundary counterexample tends to show that f^i is not a very significant factor.

Potentially Trumping Counterexample: a contrary case that would be a good counterexample with which to trump the cited case if the problem had certain additional factors. Potentially trumping counterexamples identify ways to strengthen or weaken a side's argument. They make good targets for hypothetical modifications of the problem in which the the potential counterexample would be a real trumping counterexample to a given cited case. The set of potentially trumping counterexamples that can be cited by a side, s , in response to a cited case, cc , $PTCX_{s,cc}$ is defined as follows: (Let $pvar$ denote a hypothetical variant of the problem.)

$$\begin{aligned}
PTCX_{s,cc} \equiv & \\
& \{c_j \mid (OC(c_j) = s) \wedge \\
& (\exists pvar \mid (S_{pvar,c_j} \supset S_{p,cc}))\} \quad (12)
\end{aligned}$$

In English, the set of all cases that a side s can cite as trumping counterexamples to a cited case cc is the set of all cases, c_j , such that the outcome of c_j favors s and there is some hypothetical variant of the problem, $pvar$, such that c_j is more on point with respect to $pvar$ than cc . In HYPO, we have identified a number of heuristics for hypothetically modifying a problem situation to generate $pvar$. See [Rissland 86] for more information.

The salient features of a potential counterexample are the extra similarities between it and the hypothetical variant of the problem ($pvar$), namely:

$$S_{pvar,ccx} \setminus S_{p,cc}$$

These salient features are the difference between the problem situation and a hypothetically modified problem in which a side's arsenal of cases to cite is strengthened by the addition of a new trumping counterexample.

5.4 Target for Hypotheticals

A final role of a precedent in this theory is as the target of a hypothetical modification of the problem that would strengthen or weaken the plaintiff's position. The salient features of a case that is a target for a hypothetical variation of another case to be modified ($c-mod$) are those factors in $F_t \setminus F_{c-mod}$ that are added, or those factors in $S_{c-mod,t}$ whose magnitudes are changed, to make the hypothetical more like or more extreme than the target. The set of targets for hypothetical modifications of the problem depend on what the hypothetical is designed to accomplish. For example, the set of potentially trumping counterexamples, $PTCX_{s,cc}$, is the set of targets for hypotheticals in which side s has a stronger response against cc with new counterexamples to cite.

6 Evaluating Precedential Arguments

The theory permits evaluating competing precedential arguments to a limited extent.

With respect to the ability to cite precedents, a side, s , has a stronger argument if:

$$(BCC_s \neq \emptyset) \wedge (BCC_{opp(s)} = \emptyset)$$

If neither BCC_s nor $BCC_{opp(s)}$ are empty then both sides can make strong arguments.

The theory's evaluation criterion assesses the relative qualitative strengths of an argument. The theory does not resort to "non-legal" criteria for assessing argument strength such as counting precedents on both sides. On the other hand, the theory does not take into account criteria like the recentness of precedents or the pedigrees of the deciding courts. Such commonly used legal criteria could be incorporated into the theory, for example, to break ties between equally balanced arguments.

7 Extended Example

The theory's expressions determine the features of a past case that are salient when the case is cited in the four argument roles. HYPO, which implements the theory, tailors its descriptions of a precedent to emphasize the features, specifically factors, that are salient depending on the precedent's argument role and the viewpoint the program takes, for plaintiff or defendant.

Figure 1 shows a representative sample of the variety of descriptions that HYPO generates for a single case in its knowledge base depending on the argument role and context. The extended example illustrates how the theory's expressions for salience apply to generate these diverse descriptions of the precedent, the *Data General* case. For each of the argument roles, we will work out the salient features of *Data General* applying the definitions of the previous section. These descriptions are excerpted from the complete 3-ply arguments actually generated by HYPO shown in Figures 2 through 4. The arguments involve the cases and factors illustrated in Figures 5 and 6. For convenience, the cases are summarized abstractly in terms of an outcome, a set of applicable factors, and the magnitudes of those factors. For a

more complete description of how HYPO generates the arguments, see [Ashley 87a, Ashley 87b, Ashley 88a].

As the descriptions of the *Data General* case illustrate, HYPO emphasizes various aspects of the case, sometimes focusing on similarities, sometimes differences, sometimes factor magnitudes, sometimes factors significant because they do not apply.

Cited Case: Figure 1, No. 1 shows how HYPO describes the *Data General* case as cited case (cc), where the problem situation (p) is that of the *Crown Industries* case of Figure 6. Using equation 1, the set of salient features are:

$$S_{Crown, DataGeneral} = \{f^1 f^3\} \cap \{f^1 f^2\} = \{f^1\}$$

Consequently, HYPO's description of the *Data General* case in No. 1 emphasizes f^1 and ignores f^2 . Intuitively, this makes sense. To call attention to f^2 at this point would not be tactically sound since f^2 is not a relevant similarity but a relevant difference (i.e., it is a pro-plaintiff factor that *Data General* does not share with the problem.) It is up to the defendant to point out the differences (which HYPO does in distinguishing. See Figure 2.)

Note that HYPO prefaces the description in No. 1 with the word "Even though" in recognition of the fact that although f^1 is a relevant similarity, plaintiff's disclosures to outsiders are not normally reasons for deciding in plaintiff's favor. Had there been some relevant similarities that favored the plaintiff, for example, that the plaintiff had taken substantial precautions to secure its secrets, HYPO would have stated them first. That is, HYPO would say, "Where: plaintiff took substantial security precautions, Even though: plaintiff disclosed its product information to outsiders, plaintiff should win ..."

Distinguished Case: The salient features in distinguishing a case are the relevant differences between the problem and the distinguished case, $D_{p,dc}$. Figure 1, No. 2 shows how HYPO describes the *Data General* case as a distinguished case (dc), where the problem situation (p) again is the *Crown* case. Making the substitutions for the three terms in definition 2 of relevant differences:

$$(F_{Crown} \setminus F_{DataGeneral}) \cap F_{\delta} = \{f^1 f^3\} \setminus \{f^1 f^2\} \cap F_{\delta} = \{f^3\}$$

$$(F_{DataGeneral} \setminus F_{Crown}) \cap F_{\pi} = \{f^1 f^2\} \setminus \{f^1 f^3\} \cap F_{\pi} = \{f^2\}$$

$$\emptyset \quad (M(f_{DataGeneral}^1) \not\geq M(f_{Crown}^1)) \text{ (6000 disclosures is worse, not better, for plaintiff than 7 disclosures.)}$$

Taking the union of the terms yields the set of salient differences between the *Crown* case and *Data General*, $D_{Crown, DataGeneral}$:

$$\{f^3\} \cup \{f^2\} \cup \emptyset = \{f^3 f^2\}$$

HYPO recites these differences in No. 2 of Figure 1. The differences tend to explain away the outcome in *Data General* and show that the *Crown* case need not have the same result. Figure 2 shows the complete argument.

Note that the analysis allows HYPO to select those differences in factor magnitudes that are salient in a given context. Although the magnitudes of *Data General* and *Crown* along f^1 are different, HYPO sensibly does not call attention to this difference. The difference does not help, indeed it hurts, the defendant's argument. *Crown* is much stronger for plaintiff than *Data General* in terms of the numbers of disclosures to outsiders.

The analysis also allows HYPO to point out those factors that are salient in a context because they do not apply to a case. For example, in the context of distinguishing *Data General*, f^3 is significant because it does not apply to *Data General*. The importance of this "non-feature" becomes apparent only in light of the process of distinguishing *Data General* from *Crown*.

Counterexample: Figure 1, No. 3, shows how HYPO describes the *Data General* case as a trumping and boundary counterexample (cex). Here, the problem situation (p) is a variant of the *Crown* case in which all 7 disclosures to outsiders were subject to confidentiality restrictions (i.e., $F_{Crown-var} = \{f^1 f^2 f^3\}$ and $M(f_{Crown-var}^1) = 7$) and the case cited for the defendant (cc) is the *Midland Ross* case of Figure 6. (The complete argument is shown in Figure 4.) The salient features when used as a trumping counterexample are (from expression 9):

$$\{f^1 f^2\} \setminus \{f^1\} = \{f^2\}$$

In the first sentence of No. 3, HYPO cites *Data General* as a counterexample to trump *Midland Ross* and emphasizes the extra similarities that led to the opposite result in *Data General*: namely f^2 .

When used as a boundary counterexample, the salient feature of *Data General* is f^1 , because, f^1 satisfies the requirement of definition 11:

$$\{f^1 \in F_{\delta}\} \wedge \{f^1 \in S_{Crown-var, Midland}\} \wedge [M(f_{Midland}^1) > M(f_{DataGeneral}^1)]$$

In the second sentence of No. 3, HYPO cites *Data General* as a boundary counterexample, emphasizing the fact that the plaintiff won in *Data General* even though it was a worse case than *Crown* in terms of disclosures to outsiders (6000 outsiders versus 7).

Target for Hypothetical: Figure 1, No. 4, shows how HYPO describes the *Data General* case used as a target for a hypothetical modification of the *Crown* case with the result that *Data General* would become a counterexample with which to trump *Midland Ross*. The complete argument where HYPO makes this suggestion is shown in Figure 3. The salient feature of *Data General* in this context is the extra factor, f_2 (i.e., $F_t \setminus F_{c-mod} = (F_{DataGeneral} \setminus F_{Crown}) \cap F_{\pi} = \{f^1 f^2\} \setminus \{f^1 f^3\} \cap F_{\pi} = \{f^2\}$.)

The example has illustrated how HYPO tailors a description of a precedent to suit alternative viewpoints, argument roles, problem situations, and the presence of other cases in the CKB. The interpretation of a particular precedent is flexible. For each context, the theory specifies the features of the precedent that are salient.

1. **As Case Cited by Plaintiff:**

Where: Even though: Plaintiff disclosed its product information to outsiders, plaintiff should win a claim for trade secrets misappropriation.

Cite: Data General

2. **As Case Distinguished by Defendant:**

Data General is distinguishable because:

In Crown Industries, Plaintiff disclosed its product information in negotiations with defendant. Not so in Data General.

In Data General, plaintiff's disclosures to outsiders were restricted. Not so in Crown Industries.

3. **As Counterexamples Cited by Plaintiff:**

Trumping:

Data General is more on point [than Midland Ross] and held for plaintiff where it was also the case that: plaintiff's disclosures to outsiders were restricted.

Boundary:

Data General held for plaintiff even though in Data General plaintiff disclosed its product information to more outsiders than in Midland Ross.

4. **As Target Case for Plaintiff:**

Plaintiff's response would be strengthened if: plaintiff's disclosures to outsiders were restricted. Cf. Data General.

Figure 1: Descriptions of *Data General* Case in Four Argument Contexts

==> POINT for PLAINTIFF as Side-1:

WHERE:

EVEN THOUGH: Plaintiff disclosed its product information to outsiders.

PLAINTIFF should win a claim for TRADE-SECRETS-MISAPPROPRIATION.

CITE: Data General Corp. V. Digital Computer Controls Inc. 357 A.2d 105 (Del. Ch. 1975).

<== RESPONSE for DEFENDANT as Side-2:

Data General Corp. V. Digital Computer Controls Inc. is distinguishable because:

In Crown Industries, Plaintiff disclosed its product information in negotiations with defendant. Not so in Data General.

In Data General, plaintiff's disclosures to outsiders were restricted. Not so in Crown Industries.

==> REBUTTAL for PLAINTIFF as Side-1: None.

Figure 2: Citing and Distinguishing *Data General* where CFS is the *Crown* Case

==> POINT for DEFENDANT as Side-1:

WHERE: Plaintiff disclosed its product information to outsiders.

DEFENDANT should win a claim for TRADE-SECRETS-MISAPPROPRIATION.

CITE: Midland-Ross Corp. V. Sunbeam Equipment Corp. 316 F. Supp 171 (W.D. Pa., 1970).

<== RESPONSE for PLAINTIFF as Side-2:

Midland-Ross Corp. V. Sunbeam Equipment Corp. is distinguishable because: In Midland-Ross, plaintiff disclosed its product information to more outsiders than in Crown Industries

COUNTEREXAMPLES: Data General Corp. V. Digital Computer Controls Inc. 357 A.2d 105 (Del. Ch. 1975), held for PLAINTIFF even though in Data General plaintiff disclosed its product information to more outsiders than in Midland-Ross Corp. V. Sunbeam Equipment Corp..

==> REBUTTAL for DEFENDANT as Side-1:

Data General Corp. V. Digital Computer Controls Inc. is distinguishable because: In Crown Industries, Plaintiff disclosed its product information in negotiations with defendant. Not so in Data General. In Data General, plaintiff's disclosures to outsiders were restricted. Not so in Crown Industries.

NOTE: PLAINTIFF's response would be strengthened if: Plaintiff's disclosures to outsiders were restricted. Cf. Data General Corp. V. Digital Computer Controls Inc. 357 A.2d 105 (Del. Ch. 1975)

Figure 3: *Data General* Cited as Boundary and Potentially More-On-Point Counterexamples in Argument about *Crown* Case

==> POINT for DEFENDANT as Side-1:
 WHERE: Plaintiff disclosed its product information to outsiders.
 DEFENDANT should win a claim for TRADE-SECRETS-MISAPPROPRIATION.
 CITE: Midland-Ross Corp. V. Sunbeam Equipment Corp. 316 F. Supp 171 (W.D. Pa., 1970).

<== RESPONSE for PLAINTIFF as Side-2:
 Midland-Ross Corp. V. Sunbeam Equipment Corp. is distinguishable because:
 In Midland-Ross, plaintiff disclosed its product information to more outsiders than in Crown Industries Variant.
 COUNTEREXAMPLES:
 Data General Corp. V. Digital Computer Controls Inc. 357 A.2d 105 (Del. Ch. 1975), is more on point and held for PLAINTIFF where it was also the case that: Plaintiff's disclosures to outsiders were restricted.
 Data General Corp. V. Digital Computer Controls Inc. 357 A.2d 105 (Del. Ch. 1975), held for PLAINTIFF even though in Data General plaintiff disclosed its product information to more outsiders than in Midland-Ross Corp. V. Sunbeam Equipment Corp.

==> REBUTIAL for DEFENDANT as Side-1:
 Data General Corp. V. Digital Computer Controls Inc. is distinguishable because: In Crown Industries Variant, Plaintiff disclosed its product information in negotiations with defendant. Not so in Data General.

Figure 4: *Data General* Cited as Trumping and Boundary Counterexamples in Argument about Variant of *Crown* Case

$f^1 \equiv$ Secrets-Disclosed-Outsiders (Helps defendant (δ) to extent that plaintiff has disclosed secrets to outsiders)

$f^2 \equiv$ Outsider-Disclosures-Restricted (Helps plaintiff (π) if all disclosures to outsiders are confidential)

$f^3 \equiv$ Disclosure-in-Negotiations (Helps defendant (δ) if plaintiff disclosed secrets to defendant in negotiations)

Figure 5: Three Sample Factors

Crown Industries

Outcome: Defendant won
 Factors: { $f^1 f^3$ }
 Magnitudes:
 $M(f_{Crown}^1) =$ disclosures to 7 outsiders

Midland Ross

Outcome: Defendant won
 Factors: { f^1 }
 Magnitudes:
 $M(f_{MidlandRoss}^1) =$ disclosures to 100 outsiders

Data General

Outcome: Plaintiff won
 Factors: { $f^1 f^2$ }
 Magnitudes:
 $M(f_{DataGeneral}^1) =$ disclosures to 6000 outsiders
 $M(f_{DataGeneral}^2) =$ all disclosures restricted

Crown Industries - Variant

Outcome: Defendant won
 Factors: { $f^1 f^2 f^3$ }
 Magnitudes:
 $M(f_{Crown-Var}^1) =$ disclosures to 7 outsiders
 $M(f_{Crown-Var}^2) =$ all disclosures restricted

Figure 6: Four Sample Cases

8 Factor Weights

The theory does not have a numerical method for assigning weights to factors, but then neither do attorneys. Legal experts may believe that a certain factor is generally more important than another factor, but they rarely assign numerical weights or probabilities to express the difference and they always are aware of the possibility that in some combinations of factors and magnitudes, the opposite may be true, the usually minor factor may be more significant.

The theory does enable a symbolic method for dealing with weights of competing factors. See [Ashley 88b]. One principal reason why attorneys cite precedents is to argue that one factor is more important than another. To illustrate, suppose that attorneys had only factors with which to analyze new problem situations but no precedents. Although one could analyze, for example, the variant of the *Crown* case (where $F_{Crown-Var} = \{f_1 f_2 f_3\}$) and find that f_1 and f_3 favor defendant while f_2 favors the plaintiff, one could not resolve the conflict.

With cases indexed by factors and using the definitions provided in the theory, one can do more. One can cite a precedent that has a similar combination of competing factors and argue that the same outcome should apply. Specifically, HYPOTHESIS cites *Data General* as a precedent with similar competing factors to show that the conflict should be resolved in favor of plaintiff. In other words, *Data General* can be used to support an argument that f_2 is more important (i.e., has more weight) than f_1 in the *Crown* case variant. Of course, that is not the end of the argument. One may argue that *Data General* does not show that at all, because

- ↪ Point for *Side-1*, the defendant:
Defendant cites *Midland-Ross* for the proposition that, after disclosing its information to outsiders (factor f_1), plaintiff Crown could no longer satisfy the “Secrecy” element of a trade secrets misappropriation claim.
- ↪ Response for *Side-2*, the plaintiff:
Plaintiff responds that it does not need to satisfy any Secrecy element because the Court in *Data General* relaxed the Secrecy requirement. If plaintiff in *Data General* has a Secret after disclosing its information to as many as 6000 people (factor f_1), Crown has a Secret after disclosing to only seven.
- ↪ Rebuttal for *Side-1*, the defendant: *Data General* does not relax the requirement of Secrecy. Plaintiff’s information was still a Secret despite the disclosures (Factor f_1) because the discloser agreed to maintain confidentiality (Factor f_2).

Figure 7: Argument Pitting Conflicting Theoretical Interpretations of *Data General*. (Not currently supported by the theory or HYPO.)

there is another factor at work in the *Crown* variant, f_3 which favors defendant and was not present in *Data General*. Here, the salient feature about *Data General* is that it does not have f_3 . That is a fair response, the kind that HYPO performs and that the theory’s definitions of salience capture quite well. See Figure 4.

Another way that attorneys deal symbolically with weighting factors is to provide a theoretical rationalization that a factor is or is not important in terms of a technical definition of a claim or an element of a claim. Although there are a variety of definitions of a trade secret, everyone’s definition includes the element of Secrecy (Here, the upper case in “Secret” indicates a technical legal element, not the common sense term.) The defendant in the *Crown* case would be expected to assert that every plaintiff must show as a necessary element of its trade secrets claim that the alleged trade secret is a Secret. The defendant would argue that, by virtue of factor f_1 , the plaintiff fails to show that it had a Secret. Figure 7 shows two interpretations of the *Data General* case that might play a role in the argument. By way of response, plaintiff cites *Data General*. Plaintiff’s theory of *Data General* is that it shows that factor f_1 is simply not important in *Crown*. Factor f_1 is so extreme in *Data General*, there were disclosures to so many outsiders, that the court, in effect, relaxes the requirement of a Secret. Thus, plaintiff’s rationale continues, a mere seven disclosures to outsiders, as in *Crown*, does not matter. Defendant would take a different view of the *Data General* case and its ramifications for the requirement of Secrecy. Defendant’s theory of *Data General* is that it does not show any relaxing of the requirement of Secrecy, only that factor f_2 preserves the Secret despite factor f_1 .

9 Multiple Interpretations of Precedents

In each of the alternative interpretations of *Data General* in Figure 7, the arguer employs a theoretical description to justify an assertion that a particular salient difference between a case and a counterexample is or is not important to the outcome. The arguer interprets or reinterprets the case’s significance to make it consistent with his desired conclusion.

The example suggests both a promising way to improve the theory and HYPO and a troublesome caveat. By (1) identifying elements of a claim, (2) providing a simple link between an element, like Secrecy, and factors affecting it, and (3) improving the program’s semantics for comparing a factor’s magnitudes in cases (i.e., recognizing extreme differences), the theory and the program could support a more sophisticated kind of precedential argument. With these additions, the argument in Figure 7 would be derivable from the information already generated by the theory’s expressions for counterexamples and salience.

The caveat is that even this simple extension of the theory opens a whole new range of alternative interpretations of a precedent. As we have seen, even under the existing theory, there is no one explanation of what a precedent stands for. Consider the alternative interpretations of *Data General* in Figure 1. By increasing the level of abstractions available for describing a precedent, the range of alternative interpretations expands. Credit assignment is even tougher. A precedent may be interpreted not only in terms of different symbolic assignments of weight to competing factors but different technical rationalizations explaining those assignments. To complicate matters, for any given claim, there usually are a number of competing alternative authoritative formulations of the elements and, for any given precedent, the rationale applied by the deciding judge is only one, not necessarily binding, interpretation.

As we knowledge engineers build theoretical representations for expressing what a precedent stands for, we need to design systems that support multiple interpretations of a precedent. We can no more state definitively what a precedent stands for than provide definitive rule-like definitions of a claim and its elements. The multiplicity of interpretations of what a precedent stands for is the companion problem to the problem of the open texture of legal predicates examined by [Gardner 87]. On the one hand, the cases provide meanings to the elements and rules. On the other, even simple arguments citing cases like those of Figure 7 illustrate just how slippery those elements are and how much freedom there is to reinterpret cases to suit a conclusion.

If arguments show how complex a phenomenon reasoning with precedents is, they also impose some constraints on multiple interpretations of precedents. We are not interested in representing every theoretical interpretation of a precedent, but only those that can help win an argument framed by a specific dispute, facts, and precedents to cite. The salient factual differences, as defined in the theory, are the ones that need explaining

and drive the technical rationalization. Thus, the theoretical analysis with factors using the computational definitions of significance and salience, argument context and counterexamples, can frame the issue and focus a mechanical reasoner on the salient differences to rationalize.

A more sophisticated theory of arguing with precedents will incorporate other constraints on multiple interpretations of precedents, such as:

- Posing hypotheticals, as the Supreme Court does, to eliminate alternative interpretations of a precedent [Rissland 86, Ashley 87a].
- Applying strategic argument planning to select interpretations, for example, that do not detract from other parts of ones argument. See, for example, [McGuire 81].
- Preferring interpretations that are not inconsistent with common sense meanings of elements or legal predicates. See [Gardner 87].
- Selecting interpretations that are consistent, if not with all prior cases, at least with important favorable cases or those cited by ones side in an argument or not consistent with those cited by the opponent. See [McCarty 82].
- Selecting interpretations that are "standard" in the sense that there is widespread consensus about what a case stands for, like the moral of a classic tale. See [Owens 88].

10 Conclusion

The theory provides succinct computational definitions of (1) the most persuasive precedents to cite in the principal argument roles and (2) the most salient aspects of the precedents to emphasize when citing them in those roles. The theory is accurate enough to permit the HYPO program, which implements it, to generate reasonable legal arguments.

The theory supports multiple interpretations of a precedent. The extended example has illustrated the range of different descriptions of the same precedent that are possible under the theory. Each description focuses on different salient aspects of the case depending on the argument context.

Efforts to expand the theory to accomodate more sophisticated kinds of legal argument should not abandon the goal of accomodating alternative interpretations of what a precedent stands for.

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