Arguing with Dimensions in Legal Cases

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ABSTRACT

In this short paper we introduce some novel arguments based on legal cases represented as sets of dimensions. Although there has been much work on arguments based on factors, there has been relatively little recent work which has exploited dimensional representations. The arguments that we consider have a flavour quite distinct from those generated from cases represented as factors, which lack notions of more and less favourable, and the original argumentation with dimensions from HYPO and CABARET, which always has the complete set of active dimensions in view. We would argue that the arguments produced have a good intuitive appeal and correspond to some kinds of argument commonly found when reasoning with legal cases. We consider in this paper arguments based on one and two dimensions, leaving additional dimensions largely for future work. Illustrations are provided using a set of cases well known and frequently represented in AI and Law. Although admittedly preliminary, we believe that arguing with dimensions in this way may enable a useful addition to the repertoire of legal arguments based on cases which can be used in AI and Law.

CCS CONCEPTS

• **Computing methodologies** → *Reasoning about belief and knowledge*;

KEYWORDS

Case Based Reasoning, Legal Argument, Dimensions

1 INTRODUCTION

One of the pioneering systems modelling argument from precedent cases, HYPO [5], modelled cases using *dimensions*: relevant aspects of the case which ranged from an extreme pro-plaintiff point to an extreme pro-defendant point. Following the successful use of *factors* in CATO [3], however, factors became the basis of most argumentation in AI and Law. Factors have the advantages of simplicity in that they are boolean, either present or absent, that they always favour the same party to the dispute and that they can be organised in a hierarchy of increasingly abstract factors, whereas dimensions have degree, may favour either side, and may or may not be applicable to a case. For a detailed discussion of the differences, see [21]. CATO itself gave a set of nine argumentation moves to be used to deploy factors in argumentation, and further examples of argumentation based on factors can be found in [19] and [24]. A similar form of argumentation is found in systems based on Reason Based Logic [14] and [23]. Although dimensions were used for the argumentation of CABARET [22] and never disappeared entirely [10], there has recently been a growing recognition that the boolean nature of factors is insufficiently expressive for all purposes [1], and a consequent revival of the use of dimensions [2].

Dimensions have been used for in argumentation in [20], but there the schemes are very similar to schemes based on factors, albeit the factors are replaced by points or ranges of dimensions. In [20], although dimensions are seen as the source of factors, and a link between facts and factors, the structure of dimensions is not exploited in the argumentation. In this paper we want to explore distinctive ways of arguing enabled by dimensions. We will illustrate our work with a representation of the wild animals cases introduced by Berman and Hafner [11] and subsequently much discussed in AI and Law [6]. The cases are *Pierson v Post*, *Keeble v Hickersgill*, *Young v Hitchens*, *Ghen v Rich* and *Popov v Hayashi*. Briefly the cases concern plaintiffs chasing wild animals (in the first four cases) when their pursuit was interrupted by the defendant. Post was chasing a fox for sport with horse and hound, when Pierson intervened, killing the fox with a fence pole. Keeble was hunting ducks on his own land to sell them, but Hickersgill maliciously scared them away by firing guns, Young was a commercial fisherman and was in the process of closing his nets when Hitchens, another commercial fisherman, entered the nets and made off with the fish Young was collecting. Ghen was a commercial whaler, who had harpooned a whale with a bomb lance, but the line broke and Rich found the whale when it washed ashore and sold it, in ignorance of the universally accepted convention that *the iron holds the whale*. *Popov v Hayashi*, which cited these wild animals cases, concerned disputed ownership of a baseball (valuable because it had been hit by Barry Bonds to break a home run record). Popov was attempting to complete his catch when he was assaulted by a mob of fellow spectators and Hayashi (who had not taken part in the assault) ended up with the baseball when it rolled free. The wild animals cases were cited when considering whether Popov's efforts had given him possession of the ball. These cases have been represented many times, with variations, in AI and Law, but we will use dimensions and case representations based on [8] in which dimensions were used to drive narratives based on cases. The dimensions and their points are shown in Table 1 and the cases we will use are represented as sets of dimension points in Table 2.

The next section will consider arguments based on one dimension.

2 ARGUING WITH ONE DIMENSION

Let us begin by considering a single dimension.

A dimension runs from an extreme plaintiff point to an extreme defendant point. Between these are two points of

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Table 1: Dimensions based on [8]

Dimension	Extreme P						Extreme D
LandOwnership	p-freehold		p-rent	unowned	other-owner	d-rent	d-freehold
Applicable Conventions	Statute	Written	Universally Accepted	Informal	Social		None
Closenessof Pursuit	Physical Possession	Mortal Wounding	Certain Capture	Hot Pusuit	Chasing	Started Pursuit	None
QuarryValue	Market Value	Social Value	Personal Value	Domestic Pet			None
QuarryLand Connection	resident	frequent Visitor	regular Visitor	occasional Visitor	Transient		no Connection
NatureOfAct	Violently Illegal	Illegal	Nuisance	Impolite			ActOk
PlaintiffMotive	Commerce	Gain	Altruism	Pleasure	Other	Impulse	Malice
DefendantMotive	Malice	Impulse	Other	Pleasure	Altruism	Gain	Commerce
DefendantRole	Solely Responsible	Jointly Responsible			Accident	Ignorance	Innocent

Table 2: Dimension Points for Cases based on [8]

	Pierson	*Keeble*	*Young*	*Ghen*	*Popov*
LandOwnership	Unowned	P-Freehold	Unowned	Unowned	Other Owner
Convention	Social	None	None	Universally Accepted	Informal
ClosenessOfPursuit	Hot Pursuit	Certain Capture	Certain Capture	Mortally Wounded	Hot Pursuit
QuarryValue	Social	Market	Market	Market	Market
QuarryConnection	Regular	Frequent	Resident	Resident	Frequent
NatureOfAct	Impolite	Nuisance	Impolite	ActOk	Violently Illegal
PMotive	Pleasure	Commerce	Commerce	Commerce	Gain
DMotive	Impulse	Malice	Commerce	Gain	Gain
DefendantRole	Solely Responsible	Solely Responsible	Solely Responsible	Innocent	Innocent

interest: the most favorable point for the plaintiff at which cases have been found for the defendant, and the least favorable point for the plaintiff at which cases have been found for the plaintiff. It is of course possible that the first of these will coincide with the extreme pro-plaintiff point and/or the the second will coincide with the extreme pro-defendant point. The two points may also themselves coincide. These points are derived from precedents and so will be liable to shift as more cases are decided, or they may derive from hypothetical cases used in commentaries or *obiter dicta*. The dimension can thus potentially be divided into three zones, A, B and C, although A and/or C may not exist, in which caset B will the whole range of the dimension, and the dimension is never seen as *decisive* for either party. Alternatively Zone B may be reduced to a single point, in which case the dimension will often play an especially crucial role in deciding the case.

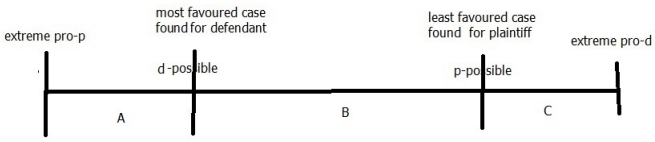

Figure 1: A single dimension

Suppose now we wish the argue for the plaintiff. We begin by locating the case on the dimension. There are three possibilities, according to whether our case falls in Zone A, B or C.

- In Zone C the dimension provides no argument for the plaintiff.
- In Zone A there is a strong argument for the plaintiff
- in Zone B there is a an argument for the plaintiff, but it is not decisive,

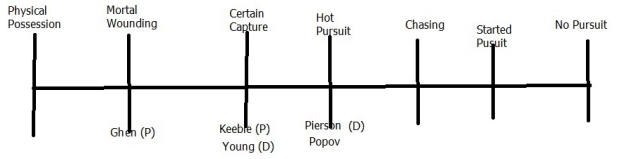

Figure 2: Closeness of Pursuit for Wild Animals Cases

Figure 2 shows the wild animal cases on the *ClosenessOf-Pursuit* dimension. With our five cases, *CertainCapure* is established as both the possible-p and the possible-d line. Thus Zone B in this instance is a single point: Zone A runs to *CertainCapure*, at which point Zone C begins. So if we are discussing Popov, we have no argument on this dimension. Indeed in the actual case Popov argued that he was certain to capture the ball, but the argument was rejected on the evidence, and his snowcone catch was seen as no better than hot pursuit. But we can make an argument for Ghen, which falls in Zone A:

A1 In Ghen, closeness of possession is decisive. The quarry was mortally wounded, and certain capture can be enough for the plaintiff, as *Keeble* shows.

To counter A1, the defendant would need to introduce another dimension, If, however, we are in Zone B, we can provide an argument for *Keeble* or *Young*. For example, the plaintiff can put forward an argument for *Keeble*, albeit weaker tahn A1:

A2 In *Keeble*, closeness of possession favours the plaintiff. The quarry was certain to be captured, and anything better than hot pursuit can be enough for the plaintiff.

Here the defendant can argue that this outcome is not clear:

A3 In *Keeble*, closeness of possession does not necessarily favour the plaintiff. The quarry was certain to be captured, but mortal wounding is required to find for the plaintiff, as in *Ghen*.

This counter argument can be strengthened since there is a defendant case at the same point:

A4 Moreover, *Young*, where capture was also certain, was found for the defendant.

Arguments in one dimension are quite limited, but often serve as a starting point for the discussion. In the next section we will consider arguments involving two dimensions.

3 ARGUMENTS IN TWO DIMENSIONS

Figure 3 shows the picture for 2 dimensions. The x-axis (dimension 1) increasingly favours the plaintiff, and the y-axis (dimension 2) increasingly favours the defendant. Suppose the plaintiff has put forward an argument based on dimension 1. Thus the case will not fall in any of Zones A, D or G, since in those zones dimension 1 is insufficiently pro-P to form the basis of an argument. Thus the plaintiff will have advanced an argument of the form of either A1 or A2. Suppose A1 has been used, so that we are in Zone F or Zone I. The defendant now needs to find a dimension that will put the case in Zone I, and argue that the new dimension is more important. Consider an hypothetical case (*KeebleHypo*) where the animal had been mortally wounded but where the defendant owned the land. Now the plaintiff puts forward the argument A5

A5 In *KeebleHypo*, closeness of possession is decisive. The quarry was mortally wounded, and certain capture can be enough for the plaintiff, as *Keeble* shows.

and the defendant can respond to A5 with A6, relying on the defendant's ownership of the land:

A6 In *Keeble*,the plaintiff owned the land, but in *Keeble-Hypo* the defendant owned the land, which is decisive, since Land Ownership takes precedence over closeness of possession.

If the priority claim is accepted, and it seems to be plausible, the ball is returned to the plaintiff's court. The plaintiff must now find a dimension which, when considered with Land Ownership, will put the case in Zone I and take priority over Land Ownership. The plaintiff's motive would put the case in the right Zone, but it remains likely that the preference will stay with land ownership. There is, however another way of using dimensions which may save the plaintiff's case. Suppose, for example that the animal in *KeebleHypo* just happened, on this one occasion, to be on defendant's land. Now the plaintiff can appeal to Quarry-Land-Connection, and counter A6 with A7:

A7 In *KeebleHypo* the defendant owned the land, but the quarry had no connection with the land, and so land ownership is not relevant.

This illustrates the possible need for one dimension to reach a certain threshold before another comes into play. Or suppose the quarry was a whale and the defendant owned the beach. Now, if we consider the convention dimension, we have a conflict between two dimensions, similar to that of A6 and if the convention takes precedence over land ownership, the plaintiff can still win.

Now suppose that the plaintiff put forward A2, so that we are in one of the three central zones, B, E, H. The defendant needs to find a dimension which will put the case in Zones E or H, since a case in Zone B cannot defeat A2. A case in Zone H will defeat A2: certain capture is not enough to overcome defendant's ownership of the land. Since the use of A2 suggests that some cases on this part of the dimension have been found for the plaintiff and others for the defendant, it may well be that it is a third dimension, such as land ownership, which discriminates between them.

The more interesting cases are where we are in Zone E: here we have reasons for and against, and we must strike a balance between them ([15], [13]). The idea is that Zone E can be divided by a line (not necessarily a straight line, any curve is possible) separating it into a defendant area (to the

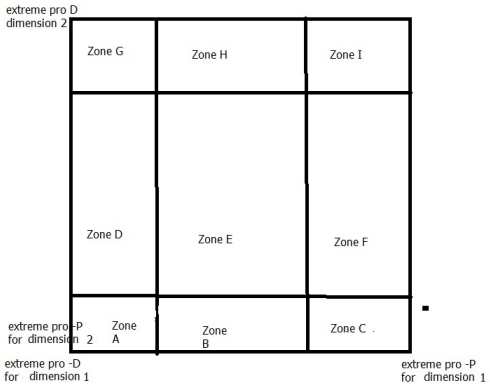

Figure 3: Two Dimensions

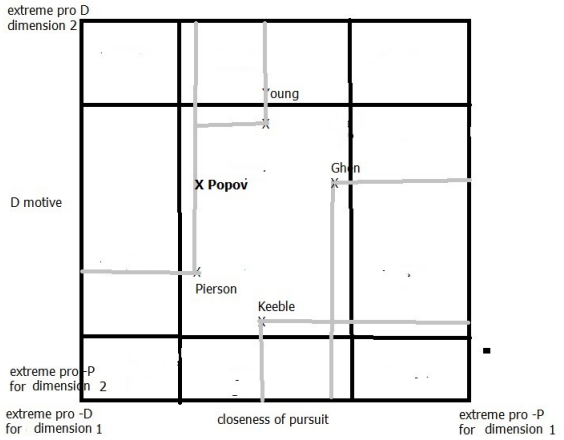

Figure 4: Precedents constrain Zone E in Two Dimensions

north-west of the line) and a plaintiff area (to the south-east). It may also be that a third dimension provides a threshold which requires consideration in this zone. For a discussion of the use balance and thresholds in statutory interpretation see [4].

Figure 4 shows how precedents constrain Zone E for closeness of pursuit and defendant motive (we put all four of decided cases in Zone E for the purposes of this example). Each of the precedents will claim an area of the Zone for its side: to the north-west for a case decided for the defendant and to the south-east for a precedent decided for the plaintiff. Given enough cases we might try to apply statistical line fitting techniques, but it is unlikely that sufficient cases are available, and the use of statistical techniques puts argumentation and explanation into a black box. As can be seen from Figure 4 it is very possible that the case under consideration will occupy an area of Zone E yet to be resolved. At this point it is possible to argue using hypothetical variations which bring the case under a precedent. Thus, the plaintiff may try to align *Popov* with *Ghen*:

A8 *Popov* should be decided as *Ghen*: If Popov had caught the ball it would have been a clear case since Rich had the same motive as Hayashi. But in both cases possession was lost through no fault of the plaintiff.

In contrast the defendant can try to bring the case under *Young*:

A9 *Popov* should be decided as *Young*: If Hayashi had been professionally engaged, it would have been a clear case, since Young was nearer to possessing the quarry than Popov. But in both cases defendant was attempting to earn money.

but better is *Pierson*:

A10 *Popov* should be decided as *Pierson*: In both cases, the plaintiff were in hot pursuit. But Hayashi had a better motive than Pierson.

It is now a question of which argument the judge finds more satisfying. The hypothetical in A8 is probably correct, but I personally would go with A9 because there is a big gap between what Popov did and completing the catch. Moreover Pierson seems to offer an even better precedent. Given the strength of A10, plaintiff in *Popov* would be well advised to avoid arguing on the basis of closeness of pursuit (once he had failed to show that a catch had been made). The nature of the interference and the plaintiff's own motive would take Pierson out of play.

4 MORE DIMENSIONS

In the previous section we saw two reasons why a third dimension might be required by one of the parties:

- To provide a threshold for a dimension to be effective, as in A7
- To provide a stronger argument to counter a currently winning argument, as in the response to A6, when the planitiff switches focus from the closeness of *KeebleHypo*'s pursuit to the nature of the act which interrupted his pursuit.

In both cases, however, we can continue to consider the dimensions pairwise, using the diagram of Figure 3. Two questions now arise:

(1) Can we always consider dimensions pairwise, or are there cases where we need to consider three or more together?
(2) Are there other ways in which a third dimension needs to be brought into consideration?

The first of these questions relates to other issues which have arisen before when considering argumentation with cases in AI and Law. For example, when we are resolving arguments based on values, as in [7], can the value conflicts be resolved pairwise, or is in necessary to compare sets of values as in [17] and [9]? Also related is whether arguments need to be allowed to accrue as in [18] or [16], or whether they can be be held to remain separate but complimentary.

We will not go into these issues in the short paper, the purpose of which is no more than to introduce the notion

of reasoning with cases represented as sets of dimensions, as currently understood. These are, however, issues that will need to be confronted if this style of argumentation is pursued.

5 CONCLUDING REMARKS

In this short, preliminary. paper we have draw attention to a current trend to represent legal cases as dimensions and considered the opportunities for generating novel styles of argument based on this representation. We argue that the arguments have a natural flavour and enable to use of arguing with hypotheticals which was an intention of [5] but which was not fully realised.

By looking at arguments with one and two dimensions we have seen the kind of arguments that can be generated, with one side proposing an argument based on one dimension and then the other countering by introducing a second dimension, and two ways in which these can be countered, by switching to a different dimension, or showing that a third dimension supplies a threshold for the applicability of one of the dimensions.

A number of questions require resolution for this motivating sketch to begin to attain maturity, including:

- We need to make more formal the dimension based arguments sketched in section 2 and 3;
- We need to consider whether dimension based arguments can always be reduced to pairs, or whether three, or more, dimensions may need to be consider simultaneously in some cases;
- We need to determine whether dimensions interact in ways additional to one supplying a threshold for the applicability of another;
- We need to link the arguments into a dialectical exchange capable of implementation: for example, a dialogue game in the manner of [12].

Although this does leave a considerable amount of work to be done, this paper can be seen as opening a door to reveal new directions for exploration. We believe that just as dimensions are an invaluable tool in the representation of cases, they may be able to provide the means of extending the repertoire of arguments available to AI and Law.

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