

New reasoning patterns in analogical legal case-based reasoning: an informal investigation

Bram Roth

Department of Metajuridica, Universiteit Maastricht, The Netherlands
bram.roth@metajur.unimaas.nl

Abstract. In this paper a not too unrealistic example of analogical case-based reasoning is presented first. Then this example is analysed with the help of an existing model of case-based reasoning. After that the model is extended with a few more complex logical mechanisms known from general theories of legal argumentation. This extension turns out to allow for a number of new patterns of reasoning on analogy, examples of which are presented informally. Then a number of other existing approaches to case-based reasoning are briefly discussed. It turns out that these approaches do not deal satisfactorily with the reasoning patterns uncovered in this paper.

1. Introduction; an example

Case-based legal reasoning is a strategy of argumentation in which one argues for or against a particular conclusion in a case by comparing it to similar past and decided ones. If such a past case is found to be sufficiently similar to the present one, then according to the principle of *stare decisis* this case should be followed and the same conclusion should hold. This reasoning pattern is commonplace in areas of common law and it is therefore not surprising that a lot of research on the subject has originated within that legal tradition ([1], [2], [3], [4], [5], [6], [7], [8], [9]). It is also becoming more popular under statute law though ([10], p. 125-127, in Dutch), and some research has already been carried out there as well ([11], [12]).

When a past case is cited in a legal dispute the issue will often arise how good the analogy is between this cited case and the present one. A party that wants a past case to be followed will emphasise the similarities between that case and the current one, a move that is often referred to as ‘analogizing’. The party that does not want a case to be followed will instead point out relevant differences between the cases, and this move is usually called ‘distinguishing’. The purpose of this paper is to suggest argumentation patterns on analogy which are possible in practice but which are not satisfactorily dealt with in the existing approaches to case-based reasoning. In particular, new opportunities for analogizing or distinguishing will be presented.

As a (fictitious) example, consider the following case:

Peter, a steel welder who is forty years of age, works at a company where there is more work than they can handle. As a result, there are many vacancies for steel welders. One day Peter has to do a job that requires more care than usual. Unfortunately he makes a serious mistake,

causing considerable damage to company property. He had not been warned in advance that the job required extra care, but his employer's reaction is nevertheless furious. Peter gets mad at him and punches him in the face. He is then dismissed for having caused considerable damage and for having committed a serious act of violence. Peter challenges the dismissal in court, arguing that the dismissal is voidable. He supports this by stating that he has always done an impeccable job and that he is highly esteemed as a colleague. He also declares that his work is all that he has. His employer repeats the reasons for dismissal in court, and adds to these the fact that Peter had once deceived them with a forged diploma. Moreover, he had once acted fraudulently with coupon books for lunches.

The employer in this example can do more than argue for the dismissal in a direct way. He can also cite a past dismissal case in which the dismissal was not found to be voidable:

George was a forty year old, married man who was employed by a bank and who had children to support. George's wife had a job too, and she had a good income. One day he had refused to follow an instruction from a superior because it demanded something out of the order from him. He had got engaged in an argument with his employer and had shouted at him. He had then left the premises and had, despite a warning to keep his temper, smashed a window by throwing a stone at it. A few days later he was dismissed for having insulted his employer and for having caused considerable damage to company property. George challenged the dismissal in court, arguing that he had children to support and that he was highly esteemed as a colleague. To this the employer replied that in the meantime a case of fraud had been discovered, and that he had once deceived them with a forged diploma.

On the basis of these facts the judge decided that the dismissal was not voidable.

Now the issue may arise whether this past case is sufficiently analogous to the present one. Peter will try to distinguish his case from George's by pointing out differences, while Peter's employer will emphasise the similarities. As possible differences one may put forward that in Peter's case a serious act of violence was committed or that in George's case there was a refusal to follow an instruction. As possible similarities one may come up with the fact that in both cases considerable damage was done to company property, or that in both cases the employee was forty years of age.

The problem is, however, whether every difference can be adduced to distinguish between cases and if not, which differences can. Likewise, one may ask which similarities can be used to analogize. A possible answer to these questions was formulated and implemented in the HYPO system ([5], [6]). The next section contains a short discussion of those aspects of that system which are most relevant to these issues.

2. An analysis according to HYPO

The HYPO model ([5], [6]) contains an analysis of the possible arguments on analogy. For this analysis the model assumes general case-independent knowledge concerning the logical role that the facts play in the establishment of a judgement. Some facts¹ are assumed to be a reason for the conclusion reached in a past case, others play a role as a reason against. Finally, some facts are assumed to be simply not legally relevant at all as a reason, and are therefore not even included in the case representation. This general background knowledge concerning facts' logical roles is then used to constrain the opportunities for analogizing and distinguishing.

¹ Here I ignore the complication that often more than one fact go into a reason (see [14], p. 13-14). Incidentally this is why the HYPO model works with 'factors' instead of facts, where 'factor' stands for a legally relevant collection of facts.

For clarity the following notational conventions will be used from now on. The facts and the conclusion that appear in cases are abbreviated as capital letters. For instance, let 'Z' express the conclusion that the dismissal is not voidable, 'A' that the employee is highly esteemed as a colleague and 'C' that the employee insulted his employer. Furthermore, in order to express that a fact has some logical role, let ' $\rightarrow$ ' be a connective standing for 'is generally a reason for' and ' $\rightarrow\neg$ ' one standing for 'is generally a reason against'. Then ' $C\rightarrow Z$ ' expresses that insulting one's employer is generally a reason for the conclusion that the dismissal is not voidable, while ' $A\rightarrow\neg Z$ ' likewise expresses that being highly esteemed as a colleague generally detracts from that conclusion.

With these conventions, the moves that are possible according to HYPO can be described as follows:

Analogizing

This move now involves pointing out a shared fact which is legally relevant to the conclusion as a reason for or against it. When the shared fact is a reason against the conclusion, this means that the new and the past case share a weakness which was overcome in the past case. When the shared fact is a reason for the conclusion, the past and present case share a strength. For instance, suppose that the fact that the employee caused considerable damage (P) is a reason for the conclusion that the dismissal is not voidable (Z): $P\rightarrow Z$. Furthermore, suppose that the fact that the employee was highly esteemed as a colleague (A) is a reason against that conclusion: $A\rightarrow\neg Z$. Then if shared both A and B are relevant similarities between the cases.

Shared features which are not legally relevant cannot be used for analogizing. For instance, let the employee's forty years of age be such an irrelevant feature. Then this similarity simply cannot be put forward in an attempt to analogize.

Distinguishing

This move is now only allowed when the fact that is not shared tends to make the cited case stronger for the conclusion than the present one. This can either be a fact which pleaded for the conclusion in the past case, or one which now pleads against it. For instance, suppose that the fact that an employee refused to follow an instruction (K) contributed to the conclusion (Z) in the past case: $K\rightarrow Z$. Furthermore, suppose that the fact that the employee has always done an impeccable job (B) detracts from that conclusion in the present one: $B\rightarrow\neg Z$. Then both K and B can be used to distinguish.

A difference which only tends to make the present case stronger for the conclusion cannot detract from the analogy. This can either be a fact which pleaded against the conclusion in the past case, or one which now pleads for it. For example, if the fact that the employee committed a serious act of violence was absent in the past case and now pleads for the conclusion for which this past case is cited, then this fact cannot be used to distinguish.

Finally, differences which are not legally relevant at all cannot be relevant to the analogy either. The employee's name, for instance, will normally not be a relevant difference.

One crucial observation that can now be made is the following. The HYPO analysis makes clear that one can distinguish between two ways of arguing on the basis of

differences between the present case and a cited one. First, there are differences which only tend to make the present case stronger for the conclusion, and such differences can be used in arguments a fortiori which directly support that conclusion. Second, one can attempt arguments by analogy which are indirect in the sense that a seeming analogy has to be established first. In order to argue against such an analogy, then, one can distinguish between the cases by pointing out differences which tend to make the cited case stronger.

The discussion that follows will be exclusively about reasoning by analogy, however, and for that reason differences that only allow for direct arguments a fortiori will not be taken into consideration any more. Instead the focus of attention will be on differences which detract from the analogy and can as such be put forward to distinguish. As in HYPO, such differences will be those which tend to make the cited case stronger for the conclusion than the present one.

3. The background knowledge extended

As explained above, in the HYPO analysis facts can only play a role as reasons that plead directly for or against the conclusion. The process of argumentation leading to a decision is then reduced to one of weighing the competing facts against each other. In practice, however, legal argumentation has a much more complex structure, as is demonstrated by a lot of recent research in this field ([13], [14], [15]). This research has made clear that more complex logical roles can be distinguished, in particular in connection with different types of exceptions.

This strongly suggests that if more different logical roles are recognised, perhaps more different kinds of arguments on analogy can be identified. Let us therefore introduce a number of extra possibilities, and see what new ways of arguing on analogy we can get out.

- Facts are often not directly relevant to a conclusion, but only because other relevant facts can be inferred from them as ‘intermediary’ conclusions. For instance, suppose that the fact that an employee insulted his employer (C) is a reason why the dismissal is not voidable (Z): $C \rightarrow Z$. Suppose, however, that all that is known is that the employee was heard shouting at the employer (D). Then the latter fact may be adduced as a reason why the former is present: $D \rightarrow C$. Of course this possibility of arguing in steps was already recognised long ago. Besides, its implications for arguments on analogy have been studied extensively (see CATO’s ‘Factor Hierarchy’ in [7]). It is nevertheless included here, because it makes interesting moves possible in combination with the exception mechanisms described next.
- It is possible that when a fact is generally a reason for or against a conclusion, due to the occurrence of an exception this may cease to be the case. As an example, suppose that having children to support (G) is generally a reason for the conclusion that a man has substantial interests in keeping his job (F): $G \rightarrow F$. Then this may no longer be the case if one also knows that the wife of the person involved has a good income (H). By introducing brackets in the notation this can be expressed straightforwardly as ‘ $H \rightarrow \neg(G \rightarrow F)$ ’. As this example illustrates, exceptions of this kind are based on reasons which normally are not directly relevant to a conclusion themselves. Instead they merely

disrupt the connection between another reason and that conclusion. In the literature such exceptions are often called ‘undercutters’ ([14], p.166, [13], p. 120/1), and this term will be used for them henceforth.

- The converse situation is possible too. When a fact is generally not relevant to a conclusion as a reason, there may be a reason why it comes to count as such after all. For instance, suppose that the fact that the employee is a steel welder (M) is generally not relevant to the conclusion (Z) that the dismissal is voidable. Then it may become relevant as a reason against that conclusion if it is also known that for that particular kind of work the employer has many vacancies (N). Again using brackets this can be expressed straightforwardly as ‘ $N \rightarrow (M \rightarrow \neg Z)$ ’. As this example illustrates, exceptions of this kind are also based on reasons which normally are not directly relevant to a conclusion themselves. Instead they merely provide support² for a connection between another reason and that conclusion. Because this kind of exceptions is the exact mirror image of the undercutting type just described, they will be called ‘mirror image undercutters’ henceforth.

Another kind of exceptions that is often formally distinguished is that of rebutters (see e.g. [15], p. 192). This kind of exception can occur when a conclusion for which a reason is present is attacked by adducing a reason against it. Now the conclusion may cease to follow if the reason for it does not weigh heavy enough in comparison to that against. This in turn depends on ‘weighing’ ([14]) or ‘priority’ ([15]) information. If such information is present it may be used to arrive at conclusions directly, and if it is not present the competing reasons may in turn be resolved by means of (other) arguments by analogy. Notwithstanding these interesting mechanisms rebutter type exceptions will presently not be included, however, and the study of their role will be left for future research.

These simple logical mechanisms are now included in the model, and the role of facts in them is again assumed as general case-independent background knowledge. Given these mechanisms it will now be investigated which new types of kinds of arguments on analogy can be identified. The resulting list is far from exhaustive, however, and more research seems necessary to uncover an underlying pattern.

4. New moves become possible

In the HYPO framework it depends on two things whether a fact can be used to analogize two cases or to distinguish between them. The first of these is a fact’s very presence in one of the cases or in both, and the second is whether this fact logically counts as a reason for or against the conclusion in the cited case. Given the newly introduced logical roles above, on both of these issues arguments now become possible.

First a number of possible moves on the presence of facts will be described, followed by a discussion of arguments on logical role. In formulating these moves the HYPO principle is maintained that one can only distinguish on the basis of differences

² This is analogous to Toulmin’s ‘backing’ of ‘warrants’. Here ‘warrants’ are general statements which authorise the connection between a reason and its conclusion, while a ‘backing’ is a statement of fact which justifies the use of a warrant ([16], p. 98 f.). In a paper that is to appear Verheij includes this same mechanism in what he calls ‘naïve dialectical arguments’ (see for a draft ‘DefLog-a logic of dialectical justification and defeat’, to be found at <http://www.metajur.nl/~bart/publications.htm>).

which tend to make the cited case 'stronger' for its conclusion than the present one (see above).

1. *Attacking a distinguishing move*

This kind of move invokes an undercutting exception to the support for a fact by a reason, as a result of which this fact ceases to be present and therefore cannot count as a difference any more. Suppose, for example, that the past case is first distinguished from the present one by pointing out that the employer was insulted (C) since the employee was heard shouting at him (D). Suppose, however, that the fact that the employee was engaged in an argument (E) was a reason why shouting (D) did not imply insulting (C): $E \rightarrow \neg(D \rightarrow C)$. Then E can be adduced to attack the distinguishing move that relied on the alleged presence of C in the past case.

This move is not independent in the sense that it would be an analogizing or distinguishing one itself. It merely serves as an attack on a distinguishing move.

2. *Distinguishing by attacking an analogizing move*

This kind of move invokes an undercutting exception in one of the cases, as a result of which the support in that case for the presence of a shared fact is not provided any more. This fact then ceases to be a relevant similarity and becomes a relevant difference instead. Suppose, for instance, that in the present case the employee has substantial interests in keeping his job (F), but that the fact that in the past case the employee's wife had a good income (H) prevented the fact that he had children to support (G) from implying that: $H \rightarrow \neg(G \rightarrow F)$. Then by pointing out H in the past case one can attack the analogizing move that relies on the presence of F in both cases. Besides, in doing so one distinguishes between the two cases since now F pleads against the conclusion.

3. *Distinguishing by assigning a logical role to a fact that is not shared*

This kind of move turns a fact that is an irrelevant difference into a relevant one by assigning to it a logical role that it at first lacked, and this is done by invoking a mirror image undercutter. Suppose, for example, that in the new case the fact that the employee is a steel welder (M) is generally not relevant for the conclusion that the dismissal is not avoidable (Z), but that the fact that there are many vacancies for steel welders (N) makes it relevant as a reason against it: $N \rightarrow (M \rightarrow \neg Z)$. Then by pointing out N in the present case one can distinguish it from the past one.

4. *Attacking a distinguishing move*

This kind of move does the exact opposite of the one just described. It turns a fact which is normally a relevant difference into an irrelevant one by depriving it from the logical role that it at first had, and this is done by invoking an undercutting exception. Suppose, for instance, that the past case is first distinguished from the present one by pointing out that the employee refused to follow an instruction (K). Suppose, however, that the fact that the instruction demanded something out of the order from the employee (L) prevented this refusal from counting as a reason for the conclusion that the dismissal is not avoidable (Z): $L \rightarrow \neg(K \rightarrow Z)$. Then by pointing out L in the past case one can attack the distinguishing move that relied on the logical role of K.

This move is not independent in the sense that it would be an analogizing or distinguishing one itself. It merely serves as an attack on a distinguishing move.

5. *Analogizing by assigning the same logical role to a shared fact*

This kind of move involves assigning a logical role to a shared fact which it at first lacked, and this is done by invoking a mirror image undercutter. Suppose, for example, that in both cases the employer committed fraud (I) and that thanks to this the shared fact that the employee had once deceived his employer with a forged diploma (R) comes to count as a reason for the conclusion (Z) that the dismissal is not voidable: $I \rightarrow (R \rightarrow Z)$. Then by pointing out I in both cases the two cases can be analogized on the basis of the presence of R in both.

6. *Distinguishing by assigning a logical role to a shared fact in only one case*

This kind of move establishes a relevant difference between both cases by assigning a logical role to a shared fact in only one of them, and this is done by invoking a mirror image undercutter. Suppose, for instance, that the fact that the employee committed fraud (I) would generally not be relevant to the conclusion that the dismissal was not voidable (Z), but that the fact that he was employed by a bank (J) made it relevant as a reason for that conclusion: $J \rightarrow (I \rightarrow Z)$. Then by pointing out J in the past case the two cases can be distinguished.

7. *Distinguishing by removing the logical role of a shared fact in only one case*

This kind of move establishes a relevant difference between both cases by preventing a shared fact to assume its normal logical role in only one of them, and this is done by invoking an undercutter. Suppose, for example, that in both cases the fact that the employee caused considerable damage (P) generally counts as a reason for the conclusion that the dismissal is not voidable (Z), but that the fact that in the present case no warning was given in advance (Q) makes it irrelevant as such: $Q \rightarrow \neg(P \rightarrow Z)$. Then by pointing out Q in the present the two cases can be distinguished.

From this list of new moves one may conclude that by allowing for more logical roles new ways of arguing about analogy become visible, and in this respect the present model can be regarded as a step forward in comparison to the HYPO system. In other words, one may say that assuming a richer³ model of legal argument in general makes it possible to provide a richer account of reasoning about analogy.

One feature of HYPO was not included in the present approach, namely the assignment of a ‘magnitude’ to the reasons⁴, which gives a measure of their ‘strength’. This magnitude allows for comparisons between cases that are based on strength of reasons, and such comparisons are not possible in the current model. In that respect, the present model is weaker than the HYPO system.

In the next section, a number of other existing approaches will be discussed.

³ In HYPO much reasoning goes into deciding whether a factor (a legally relevant collection of facts) applies. This is done automatically, however, so that it cannot be used explicitly in arguments on analogy. The present approach may be seen as one in which much of the implicit reasoning in HYPO is made explicit, demonstrating that this part of the reasoning is relevant to analogy as well.

⁴ Reasons with a magnitude are called ‘Dimensions’ in HYPO.

5. Other approaches

In the CATO model ([7]) the possibility of making multiple inference steps is accounted for by means of a so-called ‘Factor Hierarchy’, a body of background knowledge that tells which abstract conclusions can be drawn from more factual data. For instance, from the concrete fact that an employee was heard shouting at his employer CATO could draw the more abstract conclusion that this employer was insulted, just as in the present approach. The inferences in CATO are subject only to rebutter type exceptions though, so that the special analogizing and distinguishing moves identified above cannot be treated there.

Bench-Capon ([9]) describes HYPO-style reasoning in terms of two of what he calls ‘partial orders’ on rules. The first of these is based on the assumption that adding a condition to a rule always makes this rule ‘stronger’, while the second is a comparison of rules with opposite conclusions based on the outcome of precedents. He then combines these two partial orders to draw conclusions in new cases. The underlying reasoning pattern that he then uses is in effect reasoning a fortiori, though. Since in this paper the focus of attention was exclusively on reasoning by analogy, this line of investigation was not pursued here.

In the approach proposed by Branting ([3], [4]) the reasoning that led to the decision in a past case (the ‘*ratio decidendi*’) is represented as a ‘reduction graph’ which links abstract legal ‘warrants’ to more factual ones. Here warrants are a kind of rules which allow a legal conclusion to be drawn from case facts. An abstract warrant could be, for instance, the one expressed by ‘ $F \rightarrow Z$ ’ above which had as its condition that ‘the employee has substantial interests in keeping his job’ (F) and as its conclusion that ‘the dismissal is not voidable’ (Z). According to Branting this abstract warrant can be reduced to the more concrete one expressed by ‘ $G \rightarrow Z$ ’, with the more factual condition (G) that ‘the employee has children to support.’ Both the abstract legal warrant and its more factual version can now be cited from the past case.

This replacement of abstract warrants by more factual ones is itself in turn warranted by ‘reduction warrants’. In the example just used, for instance, the reduction warrant would be the one which turns the abstract warrant expressed by ‘ $F \rightarrow Z$ ’ into its more factual counterpart expressed by ‘ $G \rightarrow Z$ ’. The corresponding reduction warrant could then be expressed by ‘ $(F \rightarrow Z) \rightarrow (G \rightarrow Z)$ ’.

In the approach adopted above such arguments in steps would be treated as a stepwise inference of intermediary conclusions. For instance, instead of first deriving the factual warrant expressed by ‘ $G \rightarrow Z$ ’ and then applying it, the more abstract condition ‘F’ would first be inferred from the more concrete ‘G’, after which the abstract warrant expressed by ‘ $F \rightarrow Z$ ’ is applied. At this point it is unclear, however, what the fundamental difference⁵ is between both approaches. What is more, in the present approach warrants need not be cited from a past case because they are assumed as case-independent background knowledge. For these reasons Branting’s approach was not used in the present context, notwithstanding these interesting features.

Prakken and Sartor ([12]) give an account of case-based reasoning within the framework of a formal dialogue game. In this framework, analogizing is treated as the extraction of a rule from a past case and making this rule applicable to the new case by omitting unfulfilled conditions. Distinguishing is treated as the introduction of yet

⁵ One may say that Branting’s model focuses on concrete *interpretation* of abstract legal warrants, while in the present approach emphasis is on abstract *classification* of concrete facts. This is not a *fundamental* difference though ([14], p. 95 f.).

another rule which states as its conditions that the ones omitted from the original rule are not explicitly satisfied, and which has an opposite⁶ conclusion. The question whether a case is followed is then determined by priority information about these rules, which can be modelled as a final premise introduction ([12], p. 267).

In this way one can indeed account for the situation that a case is followed and for that where it is not. In my view, however, both of these situations should themselves be seen as the mere end product of a debate concerning the presence of a good analogy. In Prakken and Sartor's approach this intermediary step is not recognised. Their analogizing and distinguishing moves provide arguments that plead directly for or against the final conclusion and are as such rather strong. Although they seem to acknowledge this they do not consider it a real drawback, because in their view analogy is more a matter of substance than of logical form ([12], p. 266). As I hope to have illustrated informally above, however, a formal analysis of arguments on analogy is feasible.

6. Conclusion and future research

The purpose of this paper was to suggest new argumentation patterns on analogy in case-based reasoning. Taking the HYPO model as a basis, a number of more complex logical roles for facts were included and this indeed resulted in new ways of arguing on analogy. From the informal discussion of these new kinds of arguments no formal pattern has as yet emerged, however, and the study of such an underlying structure has to be left for future research.

A number of other interesting logical mechanisms were left out of consideration in this paper. I mention the rebutter type exceptions, and case comparison on the basis of the weight that is sometimes attributed to a reason⁷. It goes without saying that mechanisms like these will also have to be included in a general model of reasoning on analogy.

The results in this paper make clear that a richer model of legal reasoning in general allows for a richer model of reasoning on analogy in particular. In my opinion the resulting reasoning patterns are strictly speaking not really case-based though, since they rely on general, case-independent background knowledge. Genuinely case-based arguments on analogy come in only when other cases are cited to resolve the issue whether an analogy is sufficiently good. For instance, one can imagine arguments against an analogy in which a second past case is cited where the analogy to the first one is even 'more convincing', and where an opposite conclusion was nevertheless drawn⁸. The study of such genuinely case-based reasoning patterns is left for the future.

An interesting question that can now be posed is the following. If a richer model of legal reasoning in general allows for a richer model of reasoning on analogy in particular, does the converse also hold? Can the modelling of legal argument in general profit from a better understanding of case-based reasoning? It is my aim in future research to give a satisfactory affirmative answer to this question, by developing an integrated model of legal argument in which case-based argumentation is included next to other legal reasoning paradigms.

⁶ Prakken and Sartor introduce *two* ways of distinguishing, viz. 'weak' and 'strong' ([12], p. 263). Here I restrict myself to the latter kind.

⁷ Cf. HYPO's moves involving 'magnitude', see [6], p. 776.

⁸ Though this move may bear much resemblance to HYPO's 'trumping mechanism' it is not identical to it.

Acknowledgments

The author thanks Bart Verheij for discussion and Jaap Hage and the anonymous referees for comments on an earlier version of this paper.

References

- [1] Skalak, D.B. and Rissland, E.L. (1992). *Arguments and cases. An inevitable intertwining*. Artificial Intelligence and Law, **1**: 3-44.
- [2] Rissland, E.L. and Skalak, D.B. (1996). *BankXX: Supporting Legal Arguments through Case-Based Search*. Artificial Intelligence and Law, **4**: 1-71.
- [3] Branting, L.K. (1991). *Building explanations from rules and structured cases*. International Journal of Man-Machine Studies **34**: 797-837.
- [4] Branting, L.K. (1994). *A computational Model of Ratio Decidendi*. Artificial Intelligence and Law **2**: 1-31.
- [5] Ashley, K.D. (1990). *Modeling Legal Argument: Reasoning with Cases and Hypotheticals*. Cambridge, MA: MIT Press/Bradford Books.
- [6] Ashley, K.D. (1991). *Reasoning with cases and hypotheticals in HYPO*. International Journal of Man-Machine Studies **34**: 753-796, 1991
- [7] Alevén, Vincent (1997). *Teaching Case-Based Reasoning Through a Model and Examples..* Ph.D. dissertation University of Pittsburgh.
- [8] Bench-Capon, T.J.M. (1997). *Arguing With Cases*. Proceedings of the Tenth Jurix Conference, 85-99.
- [9] Bench-Capon, T.J.M. (1999). *Some Observations on Modelling Case-Based Reasoning With Formal Argument Models*. Proceedings of the Seventh International Conference on Artificial Intelligence and Law, 36-42.
- [10] Wiarda, G.J. (1999). *Drie typen van rechtsvinding*. Zwolle, Tjeenk Willink (in Dutch).
- [11] Oskamp, E.W. (1998). *Computerondersteuning bij straftoemeting*. Doctoral dissertation Rijksuniversiteit Leiden. Gouda Quint, Deventer.
- [12] Prakken, H. and Sartor, G. (1998). *Modelling Reasoning with Precedents in a Formal Dialogue Game*. Artificial Intelligence and Law **6**: 231-287, 1998. Dordrecht: Kluwer Academic Publishers.
- [13] Verheij, B. (1996). *Rules, Reasons, Arguments. Formal Studies of Argumentation and Defeat*. Doctoral dissertation Universiteit Maastricht.
- [14] Hage, J.C. (1997). *Reasoning with Rules. An Essay on Legal Reasoning and Its Underlying Logic*. Dordrecht: Kluwer Law and Philosophy Library.
- [15] Prakken, H (1997). *Logical Tools for Modelling Legal Argument. A Study of Defeasible Reasoning in Law*. Dordrecht: Kluwer Law and Philosophy Library.
- [16] Toulmin, S.E. (1958). *The uses of argument*. University Press, Cambridge.