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Goossens, Frank; Plug, H.J.; Wagemans, J.H.M.

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Annotating Legal Argument Schemes: A Parametric Approach

F. GOOSSENS [a,1], H.J. PLUG [a] and J.H.M. WAGEMANS [a]
[a] *Department of Speech Communication, Argumentation Theory, and Rhetoric, University of Amsterdam, the Netherlands*

Abstract. Argumentation schemes have significantly impacted AI and Law, providing a basis for annotating argument structures in large corpora and generating quantitative data for argument mining. This, in turn, can greatly benefit legal practice in areas such as litigation and consistent adjudication. This paper argues that using Wagemans' argument classification framework of the Periodic Table of Arguments (PTA) [1] offers a promising alternative to Walton's classification of argument schemes [2] for corpus annotation and argument mining in AI and Law.

Keywords. argumentation scheme annotation and argument mining and legal argumentation.

1. Introduction

Within the field of logic-based AI research, there is a lot of interest in computationally modeling legal argumentation. In such modeling, 'argument schemes' play a crucial role, as they bridge the gap between human and computational models of argument [3]. Argument schemes are defined as conventionally accepted patterns of defeasible reasoning [4]. Annotating them in large corpora provides the quantitative data necessary for computationally modeling argumentation [5], which enables argument mining: the ability of a computer to scan a text and show which arguments are used in what structure [6]. Since argument mining requires clarity about how to identify a specific argument scheme and how to distinguish between borderline cases, a classification framework is needed that is able to (1) pick out the right argument scheme by identifying its characteristics and (2) differentiate between similar schemes.

In the field of AI and law, the taxonomy of argument schemes of Walton, Reed, and Macagno [2] is widely used [7]. However, as they admit [2, pp. 12-13], this classification is neither complete nor very precise or systematic, 'perhaps because [argument schemes] have arisen out of practical concerns in dealing with real cases.' It has also been criticized by other scholars for lacking a theoretical rational [8, pp. 2], for unclarity in the connection between the schemes and the associated critical questions used for their evaluation [9, pp. 134-135], and for the varying amounts of premises they contain.

Responding to the need for a more systematic classification of argument schemes, Wagemans [8, 10] has developed a Periodic Table of Arguments (PTA). Different from

[1] Corresponding Author: Frank.J.A.Goossens@gmail.com

Walton's taxonomy, which is empirically based, the PTA takes a parametric approach to categorizing arguments. This means that argument types are distinguished by determining the values of parameters reflecting basic characteristics of arguments: their form, substance, and lever.

After having compared Walton's and Wagemans' classifications by using both to annotate a corpus, Visser et al. [5, 11] conclude both corpora "provide invaluable training and test datasets for argument mining techniques. In particular, the US2016G1tvWAGEMANS corpus opens up new avenues in automatic scheme identification by providing the means to break down the objective into simpler classification tasks" [5, p. 323].

To further analyse and evaluate the differences between Walton's schemes and the PTA framework, in this paper we examine argument schemes typically used by judges in statutory interpretation. In particular, we provide an in-depth analysis of two argument from analogy schemes presented in Macagno and Walton [12]: the argument from *analogia legis* (statutory analogy) and the argument from *analogia iuris* (legal analogy). Apart from providing information about the differences between the two approaches, our analysis shows how Walton's argument schemes containing multiple premises can be reconstructed in terms of the PTA, leading to a more precise representation of the argumentative function of the elements in the scheme. In this way, we aim to argue for the suitability and advantages of the PTA's parametric approach to argument classification for annotating legal decision-making.

The paper is structured as follows. In Section 2, we reconstruct the *analogia legis* and *analogia iuris* schemes of Macagno and Walton [12]. In Section 3, we discuss our findings, point at several issues and further reflect on them.

2. Arguments from analogy filling a legal gap

In this section, the *analogia legis* and *analogia iuris* schemes of Macagno and Walton [12] are reconstructed in terms of the PTA. Walton's schemes in Table 1 and Table 3 are based on argumentative practices and they align with reconstructions in the literature [13, 14]. To reconstruct these schemes in terms of the PTA, we have followed the guidelines in the Argument Type Identification Procedure (ATIP) [10].

Walton's schemes are idealized versions of arguments. This means the schemes contain all possible premises one can use for the *analogia iuris* and *analogia iuris* argument. To reconstruct these arguments in terms of the PTA, we take a constructive approach and aim to include as much information of Walton's schemes as possible, starting with the conclusion and working our way down to the premises (see Figure 1 and Figure 2). Because we are dealing with analogy argumentation, the first step was to determine which of these premises would, in combination with the conclusion, constitute the analogy argument type in terms of the PTA. Then, following the constructive approach, we try to include all other premises of Walton's scheme. First, it was assessed whether combinations of premises instantiated one of the four argument forms of the PTA. If this was not the case, the other premises were included in a place that explains their argumentative function. For instance, by interpreting a premise as supporting another premise or as supporting a lever (a connection between a premise and conclusion).

The premises expressing a gap in the law are left out of the reconstructions, because they are superfluous statements within the internal structure of the scheme. These 'gap

in the law' premises merely express a reason for the use of the argumentation schemes but don't directly support any other premises. For the *analogia legis* argument the 'rule premise' is also left out. This is done because we want to model the argument supporting the interpretation decision as a conclusion [14], while . the 'rule premise' precedes this conclusion.

In Table 2 and Table 4, to make the reconstruction intuitively understandable, we make use of the examples for the *analogia legis* and *iuris* arguments in Macagno and Walton [12] to represent the abstract premises of Walton's schemes.

Analogia legis reconstruction

Table 1. Argument from *analogia legis* [12]

Premise 1 (rule)	If x is P, then x has the right/is A.
Premise 2 (borderline)	It is not clear whether a (a borderline case) is P.
Similarity premise	a is similar to b.
Premise 3 (principle of classification)	b was classified as P because of the factors $f_1, f_2, \ldots, f_n$.
Redefinition premise	If x has the factors $f_1, f_2, \ldots, f_n$, then x is P.
Premise 4 (factors)	a has $f_1, f_2, \ldots, f_n$.
Conclusion	Therefore, a is P.

Table 2. Example representations of Walton's *analogia legis* scheme

Abstract Terms	
a	catching a ball
b	wounding an animal
P	possession
Factors f1, f2, …, fn	establishing partial dominion
Example Walton's *analogia legis*	
Similarity premise	Catching a ball is analogous to wounding an animal
Premise 3	Wounding an animal is possession, because one establishes partial dominion
Redefinition premise	If x establishes partial dominion and control, then x is possession
Premise 4	Catching a ball is establishing partial dominion
Conclusion	Catching a ball is possession

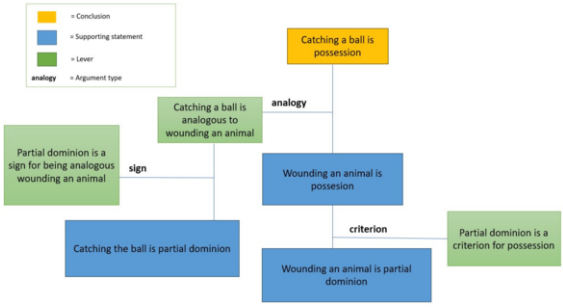

Figure 1. *Analogia legis* PTA reconstruction

Analogia iuris reconstruction

Table 3. Argument from *analogia iuris* [12]

Premise 1 (target)	No law provides for the x's that are Q.
Premise 2 (property)	If x is P, then x has the right/is A.
Similarity premise	P and Q are included/are subsets of the same functional genus G.
Species – Genus premise	If x is G, then x has the right/is A.
Conclusion	If x is Q, then x has the right/is A.

Table 4. Example representations of Walton's *analogia iuris* scheme

Abstract Terms	
P	Innkeepers
Q	Steamboat operators
G	Providers of a service of accommodation governed by contract (PSAGCs)
The right A	Being liable for guests' losses
Example Walton's *analogia iuris*	
Premise 2	If you are an innkeeper then you are liable for guests' losses
Similarity premise	Innkeepers and steamboat operators are both PSAGCs
Species - Genus premise	PSAGCs are liable for guests' losses
Conclusion	If you are a steamboat operator then you are liable for guests' losses

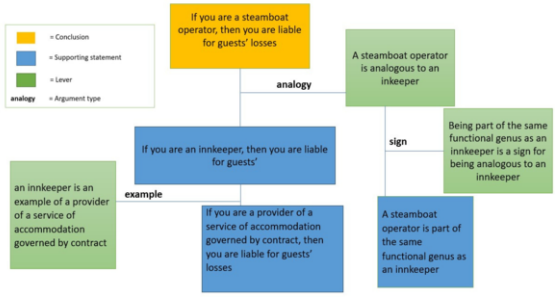

Figure 2. *Analogia iuris* PTA reconstruction

3. Discussion

From the reconstructions it becomes clear that there are several advantages of analyzing the interpretative arguments in terms of the PTA compared to Walton's schemes. In Walton's schemes, the premises remain entangled in the sense that no clear picture is painted of their specific argumentative function within the scheme. The reconstruction in terms of the PTA, by contrast, provides a very precise representation of this function. In particular, it shows, which elements function as actual premises necessary to constitute the scheme, and which elements rather function as a lever (the connection between premise and conclusion), or even as a statement supporting such lever.

Looking at the *analogia legis* argument, we see that Walton's scheme is built up out of six premises and one conclusion. However, Walton's scheme does not provide us with the information which role each premise has. This is problematic because connections between premises and conclusions often remain implicit when argumentation occurs in real life [15]. Classification of the interpretative arguments in terms of the PTA therefore helps to highlight these hidden assumptions, whereas from Walton's schemes it is not *prima facie* clear which premises have this role. For the *analogia legis* argumentation, we see that actually the similarity premise in Table 2 functions as a lever within the PTA reconstruction of Figure 1. When applying Walton's schemes to annotate examples of interpretative arguments in the wild, it can be confusing that there are premises missing. Within the PTA framework it is clear that the levers do not have to be explicit but can be assumed. Also, if a lever does appear within a text, a clear function can be assigned instead of regarding it as just another premise.

Furthermore, the fact that Walton' schemes only consist of premises and a conclusion takes away from the idea that argument schemes may contain multiple argument types. Our reconstruction in terms of the PTA revealed that the scheme of the *analogia*

iuris interpretative argument contains three different argument types: an argument from analogy, an argument from example, and an argument from sign. The argument types within an argument scheme are sometimes reflected in Walton's schemes by the name of the premises. This naming, however, is nor consistent nor the result of applying a clear, systematic, and repeatable procedure (such as the ATIP [10] associated with the PTA).

Classification of the different argument types within an interpretative argument scheme can furthermore assist in answering what is called 'procedural questions' [16] or 'critical questions' [17], which are used to evaluate the quality of arguments. The analysis of the interpretative arguments in terms of the PTA shows which evaluative questions should be answered, because it shows that multiple different argument types are used in the argumentative structures. Each of the three different argument types within the *analogia iuris* reconstruction has its own evaluative questions.

The PTA allows analysts to reconstruct interpretative argument schemes and assign a distinct role to each premise through a step-by-step process. This demonstrates that the PTA is not only better suited for classifying legal interpretative arguments but is also more systematic than Walton's schemes. In our view, the PTA offers a better fit for practical applications of argumentation theory such as argument mining[11, 3] and may thus serve as a more appropriate framework for classifying and annotating legal argument schemes for computational modeling.

A few critical remarks have to be made. The reconstruction of argument schemes in terms of the PTA can become increasingly difficult when argument schemes consist of more premises. The first two steps of the reconstruction are clear: (1) find the interpretation decision and use it as the conclusion (2) find the argument supporting the conclusion that is representative of the argument scheme. However, the other procedural steps rely more heavily on the annotator's hermeneutical skills and experience. One way towards resolving this issue would be to design a virtuous research cycle in which multiple annotators reconstruct the schemes based on the ATIP guidelines [10] and try to improve the interannotator agreement by iteratively adapting these guidelines.

Another problem is that the PTA reconstruction requires the argumentation found in the wild to be rephrased in terms of statements consisting of a subject and predicate [11]. For the reconstruction in terms of Walton's schemes, however, a similar difficulty arises, as there is no guarantee all the premises specified in the idealized version of the argument can be found in the concrete argument. While in Walton's case, this 'matching' problem cannot be resolved, for Wagemans' PTA it can be further diminished by extending the rules for standardizing the linguistic expression of arguments as they are articulated in Step 1 and 2 of the ATIP [10].

As a final remark, it is crucial to mention that both the argumentation schemes represented in this paper cannot account for all of the intricacies of the different interpretative arguments. Different understandings of the analogy argument schemes exist. In future work, it would therefore be especially interesting to see how the PTA relates to more nuanced models of legal argumentation based on factors, such as those developed by: Ashley [18], Aleven [19], Grabmair and Ashley [20], Araszkiewicz [21], Horty and Bench-Capon [22], Bench-Capon [23], Atkinson, Bench-Capon, et al. [24], Rigoni [25] and Atkinson and Bench-Capon [26].

References

1. Wagemans J. How to identify an argument type? On the hermeneutics of persuasive discourse. Journal of Pragmatics 2023 Jan; 203:117–29. DOI: 10.1016/j.pragma.2022.11.015
2. Walton D, Reed C, and Macagno F. Argumentation Schemes. Ed. by Reed C and Macagno F. New York: Cambridge University Press, 2008
3. Prakken H and Sartor G. Law and logic: A review from an argumentation perspective. Artificial Intelligence 2015; 227:214–45. DOI: https://doi.org/10.1016/j.artint.2015.06.005. Available from: https://www.sciencedirect.com/science/article/pii/S0004370215000910
4. Walton D, Sartor G, and Macagno F. An argumentation framework for contested cases of statutory interpretation. Artificial Intelligence and Law. 2016 Mar; 24. DOI: 10.1007/s10506-016-9179-0
5. Visser J, Lawrence J, Wagemans JHM, and Reed C. Revisiting Computational Models of Argument Schemes: Classification, Annotation, Comparison. *Comma*. 2018. Available from: https://api.semanticscholar.org/CorpusID:52274839
6. Walton D and Macagno F. A classification system for argumentation schemes. Argument Computation 2016 Apr; 6:1–27. DOI: 10.1080/19462166.2015.1123772
7. Atkinson K and Bench-Capon T. Argumentation schemes in AI and Law. Argument Computation 2021 Mar; 12:1–18. DOI: 10.3233/AAC-200543
8. Wagemans J. Constructing a Periodic Table of Arguments. SSRN Electronic Journal 2016 Jan. DOI: 10.2139/ssrn.2769833
9. Hornikx J. Een Bayesiaans perspectief op argumentkwaliteit - Het ad populum - argument onder de loep. Tijdschrift voor taalbeheersing 2013 Oct; 35:128–43. DOI: 10.5117/TVT2013.2.HORN
10. Wagemans J. Argument Type Identification Procedure (ATIP) - Version 4. Periodic Table of Arguments. 2021. Available from: www.periodic-table-of-arguments.org/argument-type-identification-procedure
11. Visser J, Lawrence J, Reed C, Wagemans J, and Walton D. Annotating Argument Schemes. Argumentation. 2021 Mar 1; 35. DOI: 10.1007/s10503-020-09519-x
12. Macagno F and Walton D. Arguments of statutory interpretation and argumentation schemes. International Journal of Legal Discourse. 2017; 2:47–83. DOI: doi:10.1515/ijld-2017-0002. Available from: https://doi.org/10.1515/ijld-2017-0002 [Accessed on: 2023 Oct 31]
13. Peczenik A. On Law and Reason. Dordrecht, Netherland: Springer Verlag, 1989
14. Kloosterhuis H. Van overeenkomstige toepassing. De pragma-dialectische reconstructie van analogie-argumentatie in rechterlijke uitspraken. PhD thesis. Universiteit van Amsterdam, 2001
15. Wagemans J. Why missing premises can be missed: Evaluating arguments by determining their lever. *OSSA 12 Proceedings.* 2020
16. Hinton M and Wagemans J. Evaluating Reasoning in Natural Arguments: A Procedural Approach. Argumentation 2022 Mar; 36. DOI: 10.1007/s10503-021-09555-1

17. Hornikx J and Wagemans J. Argumentatieanalyse. *Tekstanalyse Methoden en Toepassingen*. Ed. by Karreman J and Enschot R van. Assen: Koninklijke van Gorcum, 2023. Chap. 4
18. Ashley KD. Modeling legal arguments: reasoning with cases and hypotheticals. Cambridge: MIT Press, 1990
19. Aleven V. Teaching case-based argumentation through a model and examples. PhD thesis. University of Pittsburgh, 1997
20. Grabmair M and Ashley KD. Facilitating case comparison using value judgments and intermediate legal concepts. *Proceedings of the 13th international conference on artificial intelligence and law*. ACM, 2011 :161–70
21. Araszkiewicz M. Analogy, similarity and factors. *Proceedings of the 13th international conference on artificial intelligence and law*. ACM, 2011 :101–5
22. Horty JF and Bench-Capon TJ. A factor-based definition of precedential constraint. Artificial Intelligence and Law 2012; 20:181–214
23. Bench-Capon T. Representing Popov v Hayashi with dimensions and factors. Artificial Intelligence and Law 2012; 20:15–35
24. Atkinson K, Bench-Capon T, et al. Argumentation schemes for reasoning about factors with dimensions. *Legal knowledge and information systems—JURIX 2013: The Twenty-Sixth Annual Conference*. 2013 :39–48
25. Rigoni A. An improved factor-based approach to precedential constraint. Artificial Intelligence and Law 2015; 23:133–60
26. Atkinson K and Bench-Capon T. Reasoning with Legal Cases: Analogy or Rule Application? *Proceedings of the 17th International Conference on Artificial Intelligence and Law (ICAIL)*. 2021 :12–21