

Introduction

In this book, tools and techniques developed in argumentation theory and artificial intelligence are applied to problems of analyzing and evaluating argumentation used in law. Argumentation is a set of context-sensitive practical methods used to help a user identify, analyze, and evaluate arguments, especially common ones of the kind often found in everyday discourse. In the past it was the prevalent assumption that the deductive model of valid inference was the cornerstone of rational thinking. There has now been a paradigm shift to highly knowledge-dependent models of reasoning under conditions of uncertainty where a conclusion is drawn on a basis of tentative acceptance on a balance of considerations. Argumentation based on this new notion of argument, also called informal logic, is now being widely used as a new model of practical reasoning in computing, especially in agent communication in multiagent systems. Recent work in artificial intelligence and law has recently turned more and more to argumentation as a rich, interdisciplinary area of research that can furnish methods, especially in those areas of law related to evidence and reasoning (Bench-Capon, 1995; Gordon, 1995; Prakken, 2001a; Verheij, 2005; Walton, 2005). Generally, techniques and results of argumentation “have found a wide range of applications in both theoretical and practical branches of artificial intelligence and computer science” (Rahwan, Moraitis, and Reed, 2005, p. I). At the same time, artificial intelligence in law has coincided with the new evidence scholarship in law (Tillers, 2002). The general purpose of this book is to join together these techniques and results and to extend them to the problem of understanding the structure of witness testimony as a form of evidence in law. The aim is to enable a user to identify, analyze, and evaluate claims made on the basis of appeals to witness testimony used as legal evidence. It is shown that the identification and analysis problems can be solved, but that the evaluation problem is much harder.

1. Purpose of the Book

Much of the current research in artificial intelligence that develops new tools for the analysis of reasoning is not widely known to lawyers and judges, or to others, like forensic scientists, interested in reasoning about evidence. The development of this new argumentation technology in computing throws quite a different light on how to approach legal evidence, and for that matter on how evidence is treated in other fields depending on witness testimony as evidence, such as history. An important purpose of this book is to make the benefits of this specialized research initiative more widely available to those who would be likely to use it.

This is an interdisciplinary book. The author's expertise is in the field of argumentation, but the subject matter of the book is a main topic in law, specifically, in those parts of law concerned with evidence. Much of the book is concerned with recent developments in artificial intelligence, a field of computing. Because it spans all three fields, there is a question of which audience precisely the book has in mind. The author's work is known to the artificial intelligence and law community. This community is already aware of the author's articles, and for the more technical aspects of this work, also of his recent monograph *Argumentation Methods for Artificial Intelligence in Law*. The book is set out to target the audience of evidence scholars, trial lawyers, and the people who teach them. But it is not meant to use argumentation theory to explain to lawyers how to use witness testimony safely. There is already a wealth of studies on the "science of witnessing", including empirical studies on the reliability of children as witnesses, on memory, on false memory syndrome, on admissible ways to help memory along, studies into the impact of light on facial identification, and so forth. Law is already aware of these issues of witness reliability and has tools at its disposal to help the lawyer evaluating witness testimony. What is the purpose of this book, then, given its interdisciplinary approach, and which audience precisely is the book directed to?

The book uses recent developments in argumentation theory and artificial intelligence to vindicate Wigmore's thesis that there is a science of logic, a structure of reasoning representing rational argumentation underlying the rules of evidence used in law. But almost all the evidence scholars since the seventeenth century have worked in a normative framework built upon some shared assumptions underlying a rationalist approach to evidence presupposing a shared model of the normative goals of education (Twining, 2006). In Wigmore's time, however, there was only deductive logic, along with inductive rules for evaluating reasoning, available to be used to model reasoning in this structure. Recent advances in argumentation theory, moving forward using artificial intelligence tools and methods, have made possible a third alternative. It is based on defeasible reasoning models that are neither deductive nor inductive in nature. The growing acceptance of this

third approach to modeling reasoning is a paradigm shift. It has led to new standards and methods for identifying, analyzing, and evaluating reasoning, especially ones very well suitable for applicability to legal argumentation and evidence. The purpose of the book is to show how this paradigm shift applies to rethinking the modeling of rational thinking about witness testimony as a kind of evidence. It builds on the normative framework already present in shared assumptions underlying rationalist theories of evidence and law by providing new resources from argumentation theory and artificial intelligence.

The book provides an introduction to concepts, tools, and methods in argumentation theory and artificial intelligence, especially as applied to the analysis and evaluation of evidence of the kind used in law. However, it is not meant just to promote computer systems as tools to teach argumentation to young law students, although it may incidentally have this effect, one which could be quite useful. The purpose is to build a normative theory of how witness testimony is based on a kind of defeasible reasoning used as evidence in a trial. It shows how this kind of reasoning is by its nature inherently fallible, and sometimes subject to disastrous failures, but at the same time, if used properly, can be a kind of evidence that is not only necessary but inherently reasonable for guiding us logically to accept or reject a claim. By doing this it shows how the traditional disdain for witness testimony as a kind of evidence shown by logical positivists, and the views of trial skeptics who doubt that legal rules deal with witness testimony in a way that ensures a rational decision-making process, can be overcome.

Our functioning in everyday life depends crucially on rational reliance on witness testimony. Many academic disciplines other than the study of law, such as history, also rely on it. If I ask another person on the street for directions, it is rational to follow what he or she says unless I find new information indicating that it appears to be erroneous. The purpose of the book is to treat law, and the inherent rationality of legal procedure, as a benchmark to explain why such argumentation in everyday life and in these disciplines can make rational claims as to which statements to accept or reject as supported by evidence. The use of cases of legal reasoning in the book is not restricted to specific jurisdictions, but is supposed to illustrate how varied kinds of uses of witness testimony in different circumstances and jurisdictions bring out the underlying patterns of reasoning this kind of evidence is based on.

A current problem with legal argumentation is that so much of how the evidence is presented and evaluated in a trial depends on the rhetorical skills of the lawyer and the capabilities of the jury to have the critical thinking skills to match them. Although our system is an adversarial one, and persuasive rhetoric has a proper and important place in it, the problem is that juries, as lawyers well know, are highly susceptible to clever rhetorical strategies that can be used to win them over. We are all familiar with a fellow

student from high school or university who was a persuasive opinion leader, often outspoken in giving speeches and taking up causes. We easily identify such young persons as destined for political careers. The problem with legal argumentation is that the skillful lawyer who has practiced techniques of powerful speaking can exert an influence beyond the merits of the evidence in the case. Rhetorical skills are useful and necessary, but in a fair trial, participants need to be capable enough in argumentation skills to weigh evidence on both sides of a disputed case so that their individual rational decision-making capabilities are not overwhelmed by an impressive speaker. The same problem is typical in jury deliberations, where one powerful speaker often dominates the discussions and carries the others along to a conclusion that is not commensurate with the way the evidence should really balance out and determine the outcome of the case.

How can this natural, but often troublesome influence be counteracted? The only way that is going to be ultimately successful is by moderating this rhetorical factor with a counterbalance of a better appreciation of rational argumentation. All of us who are participants in the legal system need to become better at analyzing and evaluating evidence by becoming aware of the common weak spots in argumentation and by having some idea of what the requirements are for an argument that should be rationally persuasive and not just rhetorically powerful. That is the purpose of this book.

Witness testimony is a common and important form of evidence in law, and in many cases it is the main evidence on which a conviction or decision is arrived at in a trial. But many recent cases of wrongful conviction demonstrated by DNA evidence, along with social science research on memory and witness testimony (Loftus, 1979), have shown how fallible and prone to error this kind of evidence is. To follow up on what has been learned from these findings, what is needed is a better structural model of how conclusions drawn from witness testimony can be represented as a special form of evidence. Evidence, in such cases, is a matter of drawing conclusions from premises. The premises depend on trust that the witness is reporting some real events truthfully and accurately, and thus the conclusion drawn from them should be by an inference that is guarded and provisional. Still, in law, if the premises of such an argument are accepted as factual, the inferential link between the premises and conclusion can be strong enough to support drawing the conclusion, and the argument can be accepted as evidence that the conclusion is true. But should such fallible evidence be enough to secure a conviction? And how should it be evaluated as strong or weak? How can we model the structure of appeal to witness testimony as a form of argument, specify what its premises and conclusions are, identify its requirements as evidence, and pinpoint where critical questions should be raised about it? The problem is as much one of knowing how to question and criticize such arguments as it is one of knowing how they provide support for a claim.

2. Outline of the Book

In Chapter 1 it is shown how witness testimony is a kind of evidence that can be structured in the form of what is called an argumentation scheme. An argumentation scheme is a stereotypical pattern representing a form of inference in which a conclusion is derived rationally from a set of premises that are assumed to be true. An argumentation scheme is a schematic form of reasoning that displays a type of argument by identifying its premises, its conclusion, and the nature of the inferential link joining the two (Verheij, 2003). Argumentation schemes have proved to be an important new tool for representing legal reasoning in artificial intelligence (Prakken, Reed, and Walton, 2003). Many of the most common argumentation schemes represent inferences that are defeasible, meaning that they only hold tentatively and are subject to defeat in the future as new evidence comes in. The standard example of a defeasible argument is the Tweety case:

Birds fly.

Tweety is a bird.

Therefore Tweety flies.

If the premises are true, it is plausible to accept that the conclusion holds, but the conclusion may fail to hold if new evidence comes in. For example suppose Tweety is a penguin. Or suppose we find out that Tweety has an injured wing. In such cases, the argument defaults. It is defeated by the new evidence that has come in.

Suppose a witness testifies that she saw something, and then independently a second witness testifies to the same fact. The one piece of evidence is said to corroborate the other. But suppose the testimony of the second witness contradicts that of the first. This finding raises questions about one testimony or the other as evidence. Chapter 1 introduces the reader to the notion of evidence corroboration and to some tools from argumentation theory and artificial intelligence for critically questioning arguments. The method of evaluation applied to such arguments is to use a set of critical questions that match each scheme. The critical questions represent standard ways that doubts can be raised about whether the argument fitting the scheme holds or not.

From this beginning point, the book goes on to study the problem of how an appeal to witness testimony should be evaluated as a kind of argumentation that is weak in some respects and strong in others. The basic problem is that defeasible arguments of the kind fitting these argumentation schemes do not have a structure that matches that of deductive or inductive reasoning, the forms of reasoning that have been most carefully studied in the past. It is argued that neither deductive logic nor inductive reasoning of the Bayesian kind is sufficient for this task. In Chapter 2 a third form of reasoning

called plausible reasoning is introduced, and it is shown how evidence based on witness testimony is best evaluated as a form of plausible reasoning. Plausible reasoning is like deductive and inductive reasoning in that it can be studied as a kind of inference from a set of premises to a conclusion. In this framework, someone who wants to evaluate the argument can then examine the link between the premises and the conclusion by applying an argumentation scheme to it. It is argued that the tool of choice is the argument diagram, a method that displays a chain of reasoning in a given case as a sequence of connected premises and conclusions (Wigmore, 1931; Anderson and Twining, 1991; Reed and Rowe, 2002). It is shown how an argument based on witness testimony can be evaluated, using such a diagram, by attaching plausibility values to the premises, the conclusions, and the inferential links that join them together into a chain of reasoning.

The model presented in Chapters 1 and 2 represents one fairly standard way of analyzing and evaluating arguments in traditional logic. However, if we look at legal argumentation of the kind commonly found in a trial, we find that although it does fit this model up to a point, to make further progress we have to move on to a different, more complex model. This model is presented in Chapter 3 by applying theory of scripts and stories (Wagenaar, van Koppen, and Crombag, 1993) to cases in which different stories presented in witness testimony need to be evaluated by comparing them. This model is based on the idea that in a trial, for example, typically two stories are presented and one competes with the other as an account of the truth of the matter being disputed. For example, suppose a knife used to commit a crime is found at the home of the defendant. Two competing stories will typically be offered on how the knife got there. The prosecution may present an elaborate story, based on forensic evidence, showing that the knife used to commit the crime has identifiable characteristics that match it with a knife found at the defendant's home. The defendant may argue that he found the knife on the street while he happened to be walking past the area of the crime scene, and took it home. On this model of the argumentation in the case, we have two different accounts that conflict with each other, where each account presents a so-called story, a hypothetical series of alleged events that supposedly can be used to explain the facts in the case. The problem of resolving the conflict of opinions in this kind of case is based on a model different from the traditional logical one described in the previous paragraph. In this new model, each story hangs together, presenting a more or less plausible account of what really happened. One contradicts the other, meaning both cannot be true. The problem is to find some method of objectively determining which story of the two is the more plausible.

In Chapter 4 it is argued that the best tool for evaluating plausible reasoning is that of the formal dialogue system. In this model, argumentation is seen as taking place within a context of dialogue in which there are two parties, called the proponent and the respondent. Each side puts forward

argumentation of the kind that in a legal trial would be formed into a mass of evidence representing the story or account advocated by each side. The model is based on dialogue systems of a kind recently applied in artificial intelligence as the basis for interaction between autonomous agents in multi-agent systems (McBurney and Parsons, 2002, p. 257). The central thrust of the research initiative is based on the hypothesis that significant aspects of legal argumentation can be analyzed and evaluated using a dialogue model originally developed in logic to study fallacies (Hamblin, 1970) and other problematic aspects of argumentation (Hamblin, 1971; Walton and Krabbe, 1995; Walton, 1998; Krabbe, 1999). A fresh new approach called computational dialectics that is gaining momentum in artificial intelligence (AI) and legal theory views legal argumentation as a dialogue process in which there are two sides (Gordon, 1996). This dialectical (from the Greek word for conversation or dialogue) approach is different from the more widely accepted approach current in logic and cognitive science. In the latter approach, which could be called monolectical, rationality is represented by the reasoning of a single agent, or even by a set of premises and conclusions abstracted from any agent. In the dialectical model, a legal argument, one put forward as evidence in a trial, for example, can be modeled as a dialogue tableau with two columns.¹ Each column represents moves by one side, such as the asking of questions or the putting forward of arguments. Each move of one side is paired with a move of the other side. For example, a question put by one side is matched with the answer given by the other side. In a case of witness testimony in a trial, the column on the left represents the moves of the questioner who, in examination dialogue, is critically probing into the previously given account or ‘story’ of the other side. The column on the right represents the testimony of the respondent, who is presumably trying to maintain consistency and plausibility, even in response to cross-examination posing criticisms and rebuttals. On the dialectical model, legal argumentation is tested as evidence that holds up or not through the critical scrutiny of both sides in an examination dialogue.

A problem with evidence based on witness testimony is that such arguments can be accepted temporarily as a reasonable way of moving forward in an investigation, as long as they are regarded as subject to later correction when new evidence comes into the case. As noted above, witness testimony is fallible. Witnesses can and do lie, and recent cases of wrongful conviction have shown how prone to error this form of evidence can be. The new dialectical model portrays witness testimony as a defeasible form of argument and specifies the appropriate critical questions that need to be asked in order to cast doubt on this form of evidence. It shows not only how to identify appeal to witness testimony as a specific form of legal argument, but also how to analyze and evaluate examples of it by pinpointing the weaknesses

¹ Dialectical arguments are defined by Verheij (2001, p. 4) as arguments that contain not only supporting reasons, but also attacking reasons.

in them. In the new model, argument from witness testimony is analyzed as a distinct form of evidence that needs to be evaluated in a dialogue format of examination. The usual method of evaluating defeasible arguments in an investigation is by using a set of critical questions that match the specific argumentation scheme (Prakken, 2001b). The problem is that the deployment of critical questions cannot always be adequately modeled using only the argument diagramming technique. They introduce a notion of dialogue that is contextual and is difficult to model using only affirmative propositions of the kind characteristic of the representation of an argument in an argument diagram (Lodder, 1999). Appeals to witness testimony are fallible arguments that fail in some cases, and only form part of a mass of evidence. They need to be evaluated as part of a larger body of evidence in a case. Such arguments can only be evaluated by taking into account other factors. These factors include (1) burden of proof, (2) legal standards defining how strong an argument has to be in order to be successful in a given case, and (3) how well testimony that has been offered in a case hangs together as part of a plausible story, or account of what supposedly happened. As Bench-Capon and Prakken (2005) noted, a case presented to a lawyer initially takes the form of a story told by a client. Because several interpretations of such a story tend to be possible, the lawyer's job is to identify the pros and cons of these interpretations. The same kind of job of examining the pros and cons of competing stories confronts the judge or jury, who must decide how to evaluate witness testimony as evidence in a trial. But how should the trier do that? The answer given in Chapter 5 is – by weighing up the evidence on both sides in a process of evidence evaluation that takes the form of a dialogue.

Chapter 5 puts forward an innovative analysis of a special model of dialogue called examination dialogue. Examination, for example, cross-examination of a witness in a trial, is a highly visible phenomenon in legal argumentation and has been studied in trial manuals by jurists. But for the precise requirements of computational dialectics, how can examination dialogue be defined? Although it was known to the ancient Greek philosophers, to Aristotle in particular, as representing a distinctive type of reasoning called 'peirastic', few in modern philosophy or argumentation theory have previously paid much serious attention to it. An example cited by the ancients would be a case of pedagogical examination. A teacher asks a student a question to see if the student knows the answer and can present the requested information. We still use the term 'examination' for this type of dialogue. This language offers a clue to understanding the kind of examination that takes place in court. A witness presents testimony, for example, and the lawyers on both sides then take turns examining the witness. What typically happens is that the witness presents what was called a 'story' above – a connected account of some event that allegedly took place and is described by the witness. Other witness testimony or circumstantial evidence may then corroborate the testimony, or may go against it, making the original story

seem questionable. What also often happens is that a different witness may tell a different story. In fact, the story of one may be incompatible with the story of the other. How does the court attempt to judge which story is the one that should be believed? In cross-examination (Park, 2003), contradictions, weak points, or implausible parts of a story are questioned and critically probed.

Chapter 5 breaks new ground by defining the characteristics of examination dialogue as a specific type of information-seeking dialogue. The ultimate thesis of the book is that witness testimony as evidence needs to be evaluated in a given case by using two tools. One of these, as indicated above, is the argumentation scheme for argument from witness testimony. The other is the examination dialogue as the formal framework in which the argumentation is used, and needs to be evaluated by comparing and contrasting the accounts presented by both sides in the dialogue and judging which is the more plausible. Thus plausibility of argumentation is seen as a comparative matter that needs to be judged by how well each side has performed in a dialogue. Chapter 5 shows how the processes of corroborating testimony and critically probing into a story to find the weak points in it need to be seen as parts of the structure of examination as a type of dialogue, and that this structure is the key to evaluating witness testimony.

It is the argument of Chapter 5 that the structure of an examination dialogue is that of a subspecies of what is called an information-seeking type of dialogue, in which the purpose is not only to collect information but also to judge whether it is reliable or not.

As one outcome of the book, a new perspective on the concept of information is developed. In Chapter 3, the mathematical definition of information (Shannon and Weaver, 1972) is discussed, and it is shown how this positivistic view of information needs to be rethought and restructured.² To replace this positivistic view, which sees information only as the factual content of a true statement, the new theory takes a more realistic view of what is accepted as factual information under the conditions of uncertainty and lack of knowledge characteristic of evidence evaluated in a trial. The new view portrays information as something that is provisionally accepted in a dialogue even though it may later be rejected when tested during the process of examination as an investigation or trial continues.

In Chapter 5, information-seeking dialogue is further clarified by contrasting it with a type of dialogue we are all familiar with, called interrogation. Interrogation is an aggressive type of dialogue in which the proponent uses tricky tactics, even threats and force, to try to get the respondent to admit something that might be used in evidence against him.

² Although it was long dominant in both science and philosophy, this view of information has not generally been accepted in legal evidence scholarship. Legal theory never took a positivistic view with respect to reasoning about disputed facts and has long recognized that testimonial assertions can only be accepted provisionally.

Interrogation has been very little studied in the literature on argumentation, but as a type of dialogue it is closely related to information-seeking dialogue. This analysis of interrogation provides a contrast to the analysis of witness examination in the adversarial trial system, throwing much light on how evidence from witness testimony is based on different kinds of information-seeking dialogue in the two systems. From the point of view of rational argumentation, interrogation is very much a negative type of dialogue, associated more with deception, coercion, and fallacies than with logical reasoning used to move toward the truth of the matter being discussed. It is shown that in studying information-seeking dialogue, we always need to keep in mind the contrast between it and its negative counterpart, interrogation.

Examination is put forward as a complex form of dialogue that is goal-directed and has a definite structure, analyzed as a subspecies of information-seeking dialogue. It is argued that only when we understand the formal characteristics of this type of dialogue will we be able to fully understand how to properly evaluate witness testimony as a kind of evidence. Examination dialogue in law, it is argued, can be analyzed as a species of information-seeking dialogue embedded within a critical discussion type of dialogue that is central to a trial. Both types of dialogue have been analyzed in previous work in argumentation theory, the critical discussion type of dialogue much more thoroughly than the information-seeking type. Much of the book is dedicated to the advancement of our understanding of the information-seeking type of dialogue. Understanding this contextual embedding, it is argued in the book, is essential to understanding how appeal to witness testimony works as a form of argumentation that can be methodically evaluated as strong or weak. The analyses of many examples of legal argumentation presented in the book show convincingly that this new direction is a path that will need to be followed by others.

The problem posed for Chapter 6 is to see what form these types of dialogue take in a typical trial in which witness testimony is used by both sides as a form of evidence that, with other evidence, makes up the factual elements of a case. Because legal argumentation is procedurally structured in a way that is interesting from the viewpoint of dialogue theory, the study of information-seeking dialogue in law is particularly revealing. Through the study of legal argumentation, it is shown how information-seeking dialogue can elicit premises necessary as the basis for rational arguments in intelligent deliberation, informed critical discussion, and other types of dialogue that contain reasons to support or rebut a claim. Chapter 6 shows how the new theory of witness testimony should be defined and evaluated as evidence in the adversarial system of Anglo-American common law. Anglo-American law is based on an adversarial approach (van Koppen and Penrod, 2003a) in which the advocates on each side in a trial collect the information and present it to the judge or jury. The peirastic theory of examination is highly