

# Formalising Ordinary Legal Disputes: a Case Study

*Henry Prakken*

Technical Report UU-CS-2007-048  
December, 2007 (revised September, 2008)

Department of Information and Computing Sciences  
Utrecht University, Utrecht, The Netherlands  
[www.cs.uu.nl](http://www.cs.uu.nl)

ISSN: 0924-3275

Department of Information and Computing Sciences  
Utrecht University  
P.O. Box 80.089  
3508 TB Utrecht  
The Netherlands

# Formalising Ordinary Legal Disputes: a Case Study

Henry Prakken

Department of Information and Computing Sciences, Utrecht University  
Centre for Law & ICT, Faculty of Law, University of Groningen  
The Netherlands

September 22, 2008

## Abstract

This report presents a formal reconstruction of a Dutch civil legal case in Prakken's formal model of adjudication dialogues as instantiated with a rule-based logic for defeasible argumentation. The object of formalisation is the argumentative speech acts exchanged during the dispute by the adversaries and the judge. The goal of this formalisation is to test whether AI & law models of legal dialogues in general, and Prakken's model in particular, are suitable for modelling particular legal procedures; to learn about actual legal procedures; and to learn about the process of formalising an actual legal dispute.

## 1 Introduction

In this report a Dutch civil case is formalised within Prakken (2008)'s formal dialogue model of adjudication. The object of formalisation is the argumentative speech acts exchanged during the dispute by the adversaries and the judge. The goal of this formalisation is threefold:

- to test whether AI & law models of legal dialogues in general, and my model in particular, are suitable for modelling particular legal procedures;
- to learn about actual legal procedures;
- to learn about the process of formalising an actual legal dispute.

The analysed case is about ownership of a large camping tent. Its case files were published as (Leclercq; 1990), to be used in legal teaching. These files were previously used by Leenes (1998) to illustrate Hage et al. (1994)'s and Lodder (1999)'s theoretical models of legal disputes. Leenes did not attempt to give a full formalisation of the case, and he did not analyse the evidence phase at all. The present report gives such a full formalisation, and does so of the entire case, including the evidence phase.

As a legal dispute, there is not much remarkable about this case. Both the solicitors and the judge reason in rather mundane ways, and the better solicitor loses simply because his evidence is not good enough. Therefore, those interested in the modelling of the intricate details of skilled legal argument might be disappointed. However, the routine nature of this case is precisely why its modelling is important. If we want to build computer systems that support legal discourse in practice, it seems more useful to build such systems for the average case instead of for the exception, since the average case is what the average lawyer is confronted with most of the time.

Despite its mundane legal character, the case still contains some interesting argumentative features. It contains two examples of legal rules with exceptions. One of

these examples induces a shift in the burden of proof, which is explicitly expressed by the judge in an allocation of the burden of proof. The case also (implicitly) contains an argument on the priority of legal rules, and it contains a dispute on the reliability of witnesses; the latter dispute highlights the distinction between rebutting and undercutting arguments. The evidential arguments also raise the issue of accrual of arguments. On the other hand, the case does not contain sophisticated case-based reasoning or theory formation.

This report is organised as follows. In Section 2 the case and the relevant substantive law is sketched and in Section 3 a brief overview is given of Dutch civil procedure. In Sections 4 and 5, respectively, the formalisms used to represent the case and the representation methods used within these formalisms are summarised, after which the full representation is given in Section 6. Some lessons learned are discussed in Section 7. Finally, some charts visualising the dispute and the constructed arguments are displayed in an Appendix after the list of references.

## 2 The case

The case concerns a dispute concerning ownership of a movable good. Plaintiff (Nieborg) and his wife were friends of van der Velde, who owned a large tent at a camp site. At some point van der Velde mentioned that the tent was for sale for fl. 850 (approximately 380 Euro). Nieborg replied that he was interested but could not afford the price. Van der Velde still made his tent available to Nieborg, who in return helped van der Velde to paint his house, while Mrs. Nieborg for some period assisted Mrs. van der Velde with her domestic work. At some stage, Nieborg claimed that he and his wife had done enough work to pay the sales price for the tent. This made van der Velde very angry and he demanded the tent back since, so he argued, he had never sold the tent but only made it available to Nieborg for the period that van der Velde did not need it. He had done so since Nieborg had told him that he and his his wife had never had enough money to go on holiday. When Nieborg refused to return the tent, van der Velde, assisted by a group of people, threw Nieborg's son (who at that point was the only person present) out of the tent and took it away. A few months later, van der Velde sold the tent to defendant (van der Weg) and his wife. Remarkably, the sales price (fl. 850) was paid with domestic work by Mrs. van der Weg in assistance of Mrs. van der Velde; this was the same arrangement that Nieborg had claimed he had agreed with van der Velde and which van der Velde had denied.

In court, Nieborg (plaintiff) claims return of the tent to him on the basis of his ownership. van der Weg (defendant) disputes Nieborg's claim on the grounds that van der Velde had not sold the tent to Nieborg but only given it on loan, and that the work done by Mr. and Mrs. Nieborg was not done to pay the sales price but out of gratitude.

The relevant law is quite intricate<sup>1</sup>. The main legal rule governing the case is Section 2014 of the (former) Dutch Civil code (BW), which contains both a general rule and an exception on ownership of movable goods. The rule both has legal-substantive relevance (who is the owner) and legal-procedural relevance (who must prove ownership?). As for substantive issues, the general rule of 2014 BW says that "possession" of a good "in good faith" makes a person owner of the good. The exception says that if some other person was the owner of the good less than three years ago and involuntarily lost possession (e.g. by theft), that other person is still the owner. As for the burden of proof, these rules imply that possession of a good creates a presumption in favour of ownership, so that anyone who claims ownership on the basis of the exception must prove both that they involuntarily lost possession of the good less than three years ago,

---

<sup>1</sup>The numbering of the statute sections below is as it was at the time of the case, in 1974-1978.

and that at that time they owned the good.

In the present case (less than three years after the violent events) van der Weg only pro forma disputed that Nieborg involuntarily lost possession of the tent, and Nieborg easily proved this with witnesses. However, the main factual issue of the case was whether van der Velde had sold the tent to Nieborg, so that Nieborg was owner at the time of the violent events, or whether van der Velde had just given the tent on loan, so that van der Velde had remained the owner.

Besides this factual issue, the case also contained a main legal issue. To meet her burden of proof, Nieborg’s solicitor followed an intricate line of reasoning, using a cascade of three legal presumptions to prove ownership of Nieborg at the time of the violent events from the mere fact that Nieborg’s son occupied the tent at that time. Firstly, plaintiff made retrospective use of the general rule of 2014 BW that possession in good faith of a good creates a presumption of ownership, claiming that at the time of the violent removal of Nieborg’s son from the tent, Nieborg was in possession of the tent in good faith. This move raised the main legal issue of the case, viz. whether such retrospective use of 2014 BW is allowed or whether 2014 BW can only be used by the current owner of a good (in this case defendant). In highest appeal, the Dutch High Court ruled that a retrospective use was allowed.

Plaintiff had to pursue his intricate line of reasoning with two further steps to prove that at the time of the violent events Nieborg had possession in good faith of the tent. Firstly, in Dutch law “possession” does not just mean “holding” (in the physical sense); it means “holding as if one were the owner”. Here plaintiff could use another legal presumption, viz. Section 590 BW, which says that holding a good creates a presumption in favour of possessing it. Secondly, plaintiff needed to prove that Nieborg’s possession was ‘in good faith’; here plaintiff could use a third legal presumption, viz. the one of Section 589 BW that possession is presumed to be in good faith.

Was this line of reasoning sufficient for plaintiff to win the case? No it was not, since Section 590 BW states an explicit exception to the presumption in case the holding started as “holding for someone else”. Clearly, being given a tent on loan is an instance of this exception. Accordingly, while plaintiff was allocated the (easy) burden of proving that he involuntarily lost possession of the tent, defendant was allocated the (tougher) burden to prove that van der Velde had not sold the tent to Nieborg but had given it on loan. Now the outcome of the case was that both parties succeeded in meeting their burden of proof, so that defendant, who had proved the exception, won the case.

### 3 Dutch civil procedure

In this section I briefly describe Dutch civil procedure at the time of the case (1974-1978) as far as relevant for present purposes. (This description is inspired by Leenes (2001)).

A procedure is divided into a ‘pleadings’ phase, where the adversaries plead their case before the judge and provide evidence when assigned the burden of proof by the judge, and a ‘decision phase’, where the judge withdraws to decide the case. The pleadings phase is separated into a written and an (optional) oral part. In the written part the parties exchange at least two and usually four documents (recently the law was changed to make this “usually two”). The first is plaintiff’s *Statement of Claim*, which has to contain plaintiff’s claim plus his grounds for the claim (Section 140 of the Dutch Code of Civil Procedure as it was at the time of the case; 140 Rv for short). These grounds may be purely factual: plaintiff may leave out the legal ‘warrant’ connecting grounds and claim, as may both parties in all their other arguments. Also, parties do not need to explicitly state common-sense knowledge, and if they state such knowledge, they do not need to prove it. However, the judge decides what is common-sense knowledge.

Defendant replies with her *Defence*, which has to contain defendant's defences, i.e., her attacks against plaintiff's claim and grounds (141 Rv). These attacks may also concern issues of procedure, so that the procedural legality of a move can itself become the subject of dispute. The adversaries may then exchange further documents as long as allowed by the judge (142 Rv), on whose content the procedural rules state no conditions. The documents of the second turn are called *Reply* and *Rejoinder*. In these documents, both adversaries may adduce further grounds and defences (except procedural defences, which must all be stated in the *Defence*). Each party may also ask to provide oral pleading (Rv 144). During the pleadings phase plaintiff may change his initial claim (112 Rv), the adversaries may concede each others claims (181 Rv), defendant may state a counterclaim, for which she becomes plaintiff (250 Rv), and the judge assigns the burden of proof to a party whenever appropriate (e.g. 192,1 Rv), after which that party must provide evidence. After the pleadings phase has ended, the judge gives his/her verdict, bound by the following rules of evidence.

An important principle of Dutch civil procedure is that the judge is passive with respect to the factual basis of the dispute. For instance, the judge must accept undisputed claims of the adversaries, and s/he must evaluate the evidence and give the verdict on the basis of the facts adduced by the parties (176,1 Rv), with the exceptions of generally known facts (176,2 Rv) and legal rules (48 Rv). Of course, this does not mean that the judge cannot take factual decisions at all; s/he must still assess whether the facts adduced by the adversaries sufficiently support their claims, which may in turn also be factual. Also, the judge is (with a few exceptions) free to assess the relevance and strength of the evidence adduced by the adversaries, and s/he has no obligation to respond to the adversaries' arguments on these matters. For the present case study it is particularly relevant that the judge does not have to justify why s/he believes a witness and does not have to respond the adversaries' arguments on the credibility of witnesses.

As for allocating the burden of proof, the general rule is that the parties bear the burden of proving their claims; however, the judge may decide otherwise on the basis of special statutory provisions or on grounds of reasonableness (177 Rv). Among other things, this means that the burden of proof can be distributed over the parties, and that making a claim does not automatically create a burden to prove it; cf. Leenes (2001); Prakken (2001a).

When assessing the evidence provided by the parties, the judge is bound by several rules. *Conclusive evidence* must be accepted in the absence of counterevidence (178 Rv), but the other party is allowed to provide such counterevidence (179,1 Rv). For instance, an 'avidavit', i.e., an official document containing statements by a legal official, is conclusive evidence that its content is true (184 Rv). *Incontrovertible evidence* must always be accepted by the judge and cannot be attacked by counterevidence. For instance, a so-called 'decisive oath' of one of the parties is incontrovertible evidence that its content is true (50 Rv). Finally, the law states rules for admissibility of evidence, such as the rule that a witness testimony may count as evidence only for what the witness him or herself observed (189 Rv). Within these bounds, the judge is free to assess the evidence (179,2 Rv).

In fact, the case had a complicated procedural history. It was first brought before the district court. After both plaintiff and defendant pleaded their case, the court assigned plaintiff the burden of proving ownership of the tent at the time of the violent removal, thereby implicitly rejecting plaintiff's retrospective use of 2014 BW. Plaintiff appealed to this intermediate verdict at the court of appeal, but lost the appeal. Plaintiff then appealed for 'cassation' at the High Court, who accepted plaintiff's retrospective use of 2014 BW and accordingly distributed the burden of proof over the parties as explained above. Back before the district court, both parties met their burden with witness evidence, which made defendant the winner. Plaintiff then abstained from another

appeal, which brought the dispute to an end.

## 4 The representation technique: Prakken (2008)’s formal model of adjudication

The object of formalisation is the argumentative speech acts exchanged during the dispute by the adversaries and the judge. Therefore, a system is needed for so-called adjudication dialogues, i.e., for dialogues between two adversaries, plaintiff ( $\pi$ ) and defendant ( $\delta$ ), and a neutral third party. As such the system of Prakken (2008) is used, which extends Prakken (2005a)’s system for two-party dialogues with an adjudicator (in this case study called ‘judge’, ( $\iota$ )). (An early version of the three-party system was published as Prakken (2001b)). It takes a game-theoretic approach to dialogues in that speech acts are viewed as moves in a game and rules for when these moves are allowed are formulated as rules of the game. The system has a *topic language* with a *logic*, and a *communication language* with a *protocol*. The protocol specifies the allowed moves at each point in a dialogue and determines turntaking and dialogue termination. The system also has *effect rules*, which specify the effects of utterances on the state of the dialogue, and *outcome rules*. Below these elements are briefly described.

### 4.1 The topic language and logic

The topic language and logic used in this paper is Prakken and Sartor (1996)’s argument-based version of extended logic programming with defeasible priorities, as adapted by Prakken (2001a) to shifting dialectical roles. (However, the representation will be such that similar systems could be used as well.) The logic can deal with contradictory rules, rules with assumptions, inapplicability statements and priority rules. Information is expressed as a set of rules in the language of extended logic programming, which has both negation as failure ( $\sim$ ) and classical, or strong negation ( $\neg$ ). Each rule is preceded by a term, its name. Rules are *strict*, represented with  $\rightarrow$ , or else *defeasible*, represented with  $\Rightarrow$ . Facts are represented as strict rules with empty antecedents.

To give an example, the legal rules 2014,1 and 2014,2 BW discussed in Section 2 above could be formalised as follows:

$$\begin{aligned} r_1(x, y, t): & \quad \text{PossessesInGoodFaith}(x, y, t) \Rightarrow \text{Owner}(x, y, t) \\ r_2(x, y, z, t, t'): & \quad \text{PossessesInGoodFaith}(x, y, t) \wedge \text{Owner}(z, y, t') \wedge (t - t') < 3\text{years} \wedge \\ & \quad \text{InvoluntaryLoss}(z, y, t') \Rightarrow \neg \text{Owner}(x, y, t) \end{aligned}$$

Arguments can be formed by chaining rules into trees<sup>2</sup>, ignoring weakly negated antecedents. Conflicts between arguments are decided according to a binary relation of *defeat* among arguments, which is partly induced by rule priorities, which can be reasoned about as any other legal issue. For example, the following is a priority rule (the legal *Lex Specialis* principle) that could be used to adjudicate a conflict between 2014,1 and 2014,2 BW.

$$p_1(x, y): \quad \text{Exception}(x, y) \Rightarrow x \succ y.$$

If also the fact

$$f_1: \quad \rightarrow \text{Exception}(r_2, r_1)$$

is added, then a priority argument can be constructed that gives precedence to  $r_2$  over  $r_1$ .

There are three ways in which an argument  $A_2$  can defeat an argument  $A_1$ . The first is *assumption* defeat (in Prakken and Sartor (1996) called ‘undercutting’ defeat),

<sup>2</sup>Strictly speaking arguments in this logic are deductions instead of proof trees, but the conversion between these formats is straightforward.

which occurs if a rule in  $A_1$  contains  $\sim L$  in its body, while  $A_2$  has a conclusion  $L$  (note that  $\sim L$  reads as ‘ $L$  cannot be derived’). For example, the legal presumption 590 BW that holding an object presumes possession unless the holding started for someone else and its exception in case the object was obtained on loan, both discussed in Section 2, can be formalised as follows:

$$\begin{aligned} r_3(x, y, t): & \text{ Holds}(x, y, t) \wedge \sim \text{StartedHoldingForSomeoneElse}(x, y) \Rightarrow \\ & \text{Possesses}(x, y, t) \\ r_4(x, y): & \text{ ObtainedOnLoan}(x, y) \Rightarrow \text{StartedHoldingForSomeoneElse}(x, y) \end{aligned}$$

Then an argument using  $r_4$  assumption-defeats an argument based on  $r_3$ .

The other two forms of defeat are only possible if  $A_1$  does not assumption-defeat  $A_2$ . One way is by *excluding* an argument, which happens when  $A_2$  concludes for some rule  $r$  in  $A_1$  that  $r$  is not applicable (formalised as  $\neg \text{App1}(r)$ ). The other is by *rebutting* an argument, which happens when  $A_1$  and  $A_2$  contain rules that are in a head-to-head conflict (as rules  $r_1$  and  $r_2$  above) and  $A_2$ ’s rule is not worse than the conflicting rule in  $A_1$  (according to  $p_1$  and  $f_1$  this holds for  $r_2$  compared to  $r_1$  but not vice versa). Note that all these attacks can be targeted at the final rule or conclusion of an argument but also at each intermediate rule or conclusion. Also, an argument  $A_1$  is said to *strictly* defeat an argument  $A_2$  if  $A_1$  defeats  $A_2$  and not vice-versa.

Arguments are assigned a dialectical status in terms of three classes: the ‘winning’ or *justified* arguments, the ‘losing’ or *overruled* arguments, and the ‘ties’, i.e., the *defensible* arguments. Accordingly, a proposition is *justified* if there exists a justified argument for it, and it is *defensible* if it is not justified but there exists a defensible argument for it.

Whether an argument is justified can be tested in a so-called argument game between a proponent and an opponent for the argument. Proponent starts with an argument that he wants to prove justified and then each player must either defeat the other player’s previous argument or move a priority argument that stops the previous argument from defeating its target. Moreover, proponent’s defeating arguments must be such that they strictly defeat opponent’s arguments. A player wins if the other player has run out of moves. The initial argument is *justified* if the proponent has a winning strategy in this game. Non-justified arguments are *overruled* if they are defeated by a justified argument, otherwise they are *defensible*. This argument game is sound and complete with respect to grounded semantics.

In Prakken (2001a) this argument game was extended with the possibility of switching dialectical roles, to allow for the modelling of distributions of the burden of proof over the two sides in a dispute. The proof burden at stake here is the ‘burden of persuasion’, that is, the burden to prove a statement to a specified degree (the standard of proof) on the penalty of losing on the issue (cf. Prakken and Sartor 2007). The new game is between two players, called plaintiff ( $\pi$ ) and defendant ( $\delta$ ), who at any time can have either proponent role ( $P$ ) or opponent role ( $O$ ), depending on the context. The input of the new logic is not just a set of rules but also an allocation of proof burdens for some literals to both parties. Plaintiff starts each game as proponent but then these roles are reversed each time the player currently having opponent role moves an argument for a conclusion for which the burden of proof is allocated to him: the player then becomes the proponent with regard to that conclusion and thus he has to strictly defeat the other player’s arguments.

## 4.2 The communication language

The communication language of the dialogue system, summarised in Table 1<sup>3</sup>, is a set of speech acts ordered by a binary reply relation, where each reply is either an attack on

<sup>3</sup>In this table the complement of a formula  $\varphi$ , denoted by  $\neg\varphi$ , is  $\neg\varphi$  if  $\varphi$  does not start with a negation and  $\varphi'$  if  $\varphi = \neg\varphi'$ .



or surrender to its target. A dialogue is a sequence of moves, where a dialogue move is a speech act moved by one of the participants, indicating to which preceding move in the dialogue it replies. Each speech act has a locution part and a content part; the former indicates the type of speech act while the latter, if not empty, is either a statement from the topic language or an argument from its logic. The language allows the participants to claim, dispute, concede and retract propositions, to move arguments in support of propositions (whether claimed or moved as a premise of another argument), to attack arguments with counterarguments and to move priority arguments. Furthermore, a party can try to put the burden of proof onto another party by replying to a disputing of  $\varphi$  (i.e., to a *why*  $\varphi$  move) with disputing the opposite of  $\varphi$  (i.e., with a *why*  $-\varphi$  move). The language also contains three speech acts to be only used by the adjudicator, namely, for terminating a dialogue, for ruling a move legal-procedurally illegal and for determining the burden of proof concerning statements disputed by the adversaries. Note that when the adjudicator rules a move procedurally illegal, this does not mean that the move violates the rules of our formal dialogue game but that it violates the rules of the applicable legal procedure (in our case study Dutch civil procedure). Finally, a turn is a maximal sequence of dialogue moves moved by the same participant; each turn is ended by moving the *pass* speech act.

Table 1: A communication language for adjudication dialogues

Acts	Attacks	Surrenders
<i>claim</i> $\varphi$	<i>why</i> $\varphi$ <i>illegal</i> $m$	<i>concede</i> $\varphi$
<i>why</i> $\varphi$	<i>argue</i> $A$ ( $\text{conc}(A) = \varphi$ ) <i>why</i> $-\varphi$ <i>burden</i> ( $-\varphi, a$ ) <i>illegal</i> $m$	<i>retract</i> $\varphi$
<i>argue</i> $A$	<i>why</i> $\varphi$ ( $\varphi \in \text{prem}(A)$ ), <i>argue</i> $B$  <i>illegal</i> $m$	<i>concede</i> $\varphi$ ( $\varphi \in \text{prem}(A)$ or $\varphi = \text{conc}(A)$ )
<i>concede</i> $\varphi$	<i>illegal</i> $m$	
<i>retract</i> $\varphi$	<i>illegal</i> $m$	
<i>illegal</i> $m$		
<i>burden</i> ( $\varphi, p$ )		
<i>pass</i>		
<i>terminate</i>		

### 4.3 The protocol

The protocol divides each dialogue into a *pleadings phase*, in which the parties plead the case and the adjudicator merely regulates the dispute, and a *decision* phase, in which the adjudicator is the only player and has to decide the dispute.

Each dialogue starts with an initial claim or argument by the plaintiff, which initiates the pleadings phase. In this phase each further move must reply to a move of the other party in an earlier turn, where each reply must be licensed by the reply structure of the communication language. In the pleadings phase the adjudicator may only rule a move legal-procedurally illegal, determine the burden of proof concerning statements disputed by the adversaries and terminate the pleadings phase; these moves cannot be made by the adversaries. As for *turntaking*, in the pleadings phase an adversary may in

each turn make as many moves as he wants. He may also move alternative replies to the same move, whether in the same turn or later. When an adversary has ended his turn, the turn shifts to the adjudicator. She first decides on the procedural correctness of the moves made in the previous turn, by deciding whether or not to move an *illegal* move. Then she can allocate the burden of proof of propositions that have been disputed with a *why*  $\varphi$  move by replying with a *burden* $(-\varphi, a)$  reply to that move or with a *burden* $(\varphi, a')$  reply to the target of the disputation (where  $a$  and  $a'$  are the two adversaries). Finally she decides whether to terminate the pleadings phase. If she does not terminate it, then the turn shifts to the current loser (to be defined below) at the end of the adjudicator's turn.

In the decision phase only the adjudicator can move and until termination she can only move arguments, including counterarguments and priority arguments. She must still respect the reply structure of the communication language but she may reply to her own moves; the latter allows 'internal dialectic', in which the adjudicator considers and rejects possible counterarguments to her arguments.

Finally, in both the pleadings and decision phase *argue* moves must respect the rules of the argument game of the underlying logic. This can be verified in terms of the so-called 'associated argument graph' of a dialogue, to be described below.

#### 4.4 Outcome rules

When the adjudicator terminates the decision phase, the winner is determined by the so-called dialogical status of plaintiff's main claim, as follows. Since each non-initial dialogue move (except a *pass* and *terminate* move) replies to precisely one earlier dialogue move, and since alternative replies to a move are allowed, a dialogue can be viewed as a tree of dialogue moves linked by reply relations of two kinds. This tree structure is exploited by the definition of *dialogical status* of a move. Briefly, a move is *in* if either it has a surrendering reply or else all its attacking replies are *out*. And an attacking move is *out* if it has an attacking reply that is *in*. Note that this makes the attacking leaves of the dialogue tree trivially *in*.

Dialogical status is used for determining both the 'current' and 'final' winner and loser of a dispute (the current winner is the winner at any given nonterminated dialogue stage, while the final winner is the winner at termination of the decision phase). If at a certain intermediate (or final) stage the initial claim is *in*, plaintiff currently (finally) wins, otherwise defendant currently (finally) wins. As noted above, the notion of a current winner can be used to define turntaking. It can also be used to impose a relevance criterion on moves. Briefly, this criterion says that each move must reply to a target such that, if that target were attacked, the mover of the attack would become the new current winner. In effect, this means that in a protocol requiring that moves are relevant the adversaries' turns must consist of zero or more surrenders followed by zero or one attacker, after which the turn shifts. However, in the formalisation below I will not require that each move be relevant, since in legal disputes of this kind the adversaries often exchange lengthy documents with various alternative attacks and defences, so that the turn cannot shift as soon as the dialogical status of the main claim has changed. In terms of Prakken (2005a) the protocol used is that for so-called *liberal dialogues*.

#### 4.5 Effect rules

The most immediate effect of a move is that it is appended to the dialogue so far. Furthermore, *argue* moves have an effect on the so-called 'associated argument graph' of the dialogue, which contains all arguments and counterarguments that were stepwise built during a dialogue and their dialectical relations. This graph can be used to verify

whether an *argue* move respects the rule of the argument game of the underlying logic. Moreover, the so-called *defended part* of the argument graph can be obtained by omitting all arguments that have disputed premises for which no further argument was moved. Ideally, the outcome of the dialogue corresponds with its argument graph in that the initial move of a dialogue is *in* just in case the defended part of the argument graph makes an argument for the initial claim justified. In Prakken (2005a) it is proven that this holds on two conditions: that no surrenders are moved (since a player can, for instance, concede or retract a claim even if he logically does not have to) and that the dialogue is ‘logically completed’, i.e., no new relevant arguments can be moved in the dialogue without stating new premises.

## 5 Formalisation method

Within the formalisms of Section 4 some modelling choices must be made. Firstly, although a formal logic is assumed, the various arguments and propositions will be semiformal paraphrased. In particular, the elementary propositions will not be written as formal predicate-logic expressions and rule premises will be left implicit or only named.

An important representation issue is that of unexpressed premises. As explained above, Dutch civil procedure allows the adversaries to leave the applicable law and commonsense knowledge implicit, and requires the judge to complete such incomplete arguments. However, the present combination of dialogue system and logic does not allow for logically incomplete arguments, and therefore this feature of the dispute cannot be modelled. I assume that each argument is complete according to the logic, but in presenting arguments I will leave common-sense and legal classification rules implicit and mention legal rules by their name only, assuming that the logical form of all these rule premises is that of a defeasible rule in the above-sketched logic of Prakken and Sartor (1996).

A related issue here is that of defeasible inference rules. In (Prakken and Sartor; 1996) the only possible inference steps within an argument are standard-logical reasoning as well as defeasible modus ponens applied to rules. However, we will see below that several rule premises are in fact based on general defeasible argument schemes (Walton; 1996; Garssen; 2001), such as temporal persistence and reasoning from witness evidence. Argument schemes are stereotypical forms of reasoning and critical questions are pointers to counterarguments of arguments formed with these schemes. In the logic of Prakken and Sartor (1996) argument schemes must be formalised as defeasible rules and negative answers to critical questions as arguments against the applicability of a rule. In the present case this is only relevant for rule premises based on the witness testimony scheme. I will assume that this scheme has the following semi-formal nature:

Witness *W* says that  $\varphi$ , therefore (presumably)  $\varphi$

and has the following critical questions:

1. Was *W* in the position to know about  $\varphi$ ?
2. Is *W* sincere?
3. Did *W*’s senses function properly when observing  $\varphi$ ?
4. Did *W*’s memory function properly when testifying that  $\varphi$ ?

Questions 2,3 and 4 are based on David Schum’s work on witness reliability (e.g. Schum (1994)) while the positive answer to (1) is regarded by Walton (1996) as a premise of the scheme; I have instead made it into a critical question, since all arguments in this case using witness testimonies leave it implicit so that a positive answer is arguably assumed. In the present logic the scheme translates to a rule

$$r_w: \text{Witness}(x, \bar{\varphi}) \wedge \text{Says}(x, \bar{\varphi}) \Rightarrow \varphi$$

Here  $\bar{\varphi}$  is a term denoting the literal  $\varphi$ . Furthermore, the second critical question induces the inapplicability rule

$$q_{w1}: \neg \text{Sincere}(x, \bar{\varphi}) \Rightarrow \neg \text{Appl}(r_w(x, \bar{\varphi}))$$

Since the other critical questions play no role in the present case, they will not be formalised.

Another issue is the proper formalisation of priority arguments. As explained above in Section 4.1, in (Prakken and Sartor; 1996) this is modelled directly as arguments about the relative priority of conflicting rules. For example, in the present case plaintiff argues that Section 2014,2 BW prevails over Section 2014,1 BW since the second is an exception to the first. In the present logic this argument can be formalised as explained above. However, others, e.g. Hage (1997) and Kowalski and Toni (1996), have argued that it is better to formalise priority arguments as arguments on the applicability of rules. If this method is applied in the present logic, then rule  $p_1$  in Section 4.1 must be changed to:

$$p'_1: \text{Exception}(r, r') \wedge \text{Conflict}(r, r') \wedge \text{Appl}(r) \Rightarrow \neg \text{Appl}(r')$$

Moreover, the predicate **Conflict** must be defined in further rules. My formalisation will not crucially depend on which method is chosen. Although it will contain a direct priority argument, the formalisation can easily be adapted to the other method.

The next issue is that of accrual of arguments, or whether a logic should formalise the principle that having more arguments for the same conclusion improves one's position. In (Prakken; 2005b) that this can be modelled if a logic in the style of Pollock (1995) is adopted, with defeasible inference rules and a distinction between rebutting and undercutting defeat. To make the logic of Prakken and Sartor (1996) suitable for modelling accrual, the accrual inference rule and its undercutter proposed in Prakken (2005b) should be added to the logic. However, a discussion of this method is beyond the scope of this paper. (Note that the 'reason-based logic' of Hage (1997) already has an accrual mechanism.)

As for the dialogue structure, the formalisation will not reflect the actual order in which the dispute evolved; rather it will reflect the structural-dialogical relations between the various procedural acts. (In fact, in one case a reply to a certain statement was made before the statement itself! Such moves are possible since the parties already discussed the case with each other before it was brought to court, so they more or less know each other's positions.) The reasons for this choice will be explained in more detail in Section 7.

## 6 The Representation

In this section I formalise the Nieborg v. van der Weg case as it took place in the initial stage, thereby ignoring the judge's initial allocation of the burden of proof, which, as stated above, was overturned in highest appeal. Instead, I will proceed as if the High Court's allocation given immediately by the initial court. The representation is based on the case files as published in Leclerq (1990), in particular the adversaries Statement of Claim, Defence, Reply and Rejoinder and their conclusions after the witness interrogations, and the court's final verdict. In agreement with Prakken (2008) the formalisation is divided into a pleadings and a decision phase. The pleadings phase is further divided into the part before the witness testimonies, in which the legal issues were discussed (Claim, Defence, Reply, Rejoinder and intermediate verdict) and then the phase following these testimonies, in which it was discussed to what extent the evidence supports the legal claims.

In the model of (Prakken; 2008) each turn must end with a *pass* move. Below I will leave these moves implicit. Also, since procedural legality of moves was not at issue, I will below not say anything on this. Note that all moves are implicitly ruled legal by the judge.

The appendix contains various charts that visualise the dispute and the arguments made.

## 6.1 Discussing the legal issues in the pleadings phase

At the start of the dispute, plaintiff is proponent and defendant is opponent in the underlying argument game. This means that plaintiff's counterarguments must strictly defeat their target, while defendant's arguments only need to defeat their target. (some tedious but inessential legal-technical detail has been left out of plaintiff's first argument.)

$\pi_1$ : *argue*  $A_1$  (1) I owned the tent at  $t_1$ , *so* (2) I own the tent now at  $t_3$ . Furthermore, (3) defendant holds the tent, (4) I involuntarily lost possession of the tent at  $t_1$ , *so* by Section 2014,2 BW (5) defendant must return the tent to me.

(Plaintiff starts the dispute with an argument for his main claim. Note that the implicit commonsense rule that is used to infer (2) is in fact the argument scheme of temporal persistence.

$\delta_2$ : *concede* (3) I hold the tent. (Target:  $\pi_1$ )  
-  $\delta_2$  moves a surrender, so  $\pi_1$  stays in.

$\delta_3$ : *why* (1) plaintiff was owner at  $t_1$ ? (Target:  $\pi_1$ )  
-  $\pi_1$  is made out by defendant's *why* attack.

$\delta_4$ : *why* (4) did you involuntarily lose possession of the tent at  $t_1$ ? (Target:  $\pi_1$ )  
( $\delta_3$  and  $\delta_4$  are expressed in the defence as "defendant denies that plaintiff involuntarily lost possession of the tent while being the owner". Arguably, a denial is stronger than just a disputation, implying a claim to the contrary statement.)  
-  $\pi_1$  stays out. Note that therefore according to Prakken (2005a)'s notion of relevance this move is irrelevant.

$\delta_5$ : *argue*  $A_2$ : (6) I bought the tent at  $t_2$  from V at a price of fl. 850, (7) V delivered the tent to me at  $t_2$ . Furthermore, (8) my wife did domestic work for van der Velde valued fl. 850, *so* (9) I paid the sales price; *so* I obtained the tent in possession in good faith at  $t_2$ , *so* by 2014, 1 BW (10) I became owner of the tent at  $t_2$ , *so* (11) I now own the tent at  $t_3$ . Furthermore, (12) plaintiff has no other right to the tent, *so* (13) I do not have to return the tent. (Target:  $\pi_1$ )

(Defendant states a first counterargument, stating that by buying and obtaining the tent from van der Velde, he obtained the tent in possession in good faith and so has become the owner of the tent. (In fact, defendant never stated premise (7) which his argument legally rather clumsy, since ownership is not transferred by the sales agreement but by the act of deliverance by the previous owner. However, applying the charity principle, premise (7) can be said to have been implicitly stated. Defendant's actual argument is clumsy for another reason, since he says that because of buying and paying the tent he "became the owner in good faith". Here he confuses the two distinct legal concepts of possession in good faith and ownership: it is 2014, 1 BW that (in general) makes the possessor in good faith the owner. I have interpreted the argument as above (making the distinction explicit in the correct way) since defendant did not claim that van der Velde was the owner of the tent when he sold it, so that the only way to argue that he

became the owner by the sale and delivery is by invoking 2014, 1 BW. Note also that the argument ends with a metalevel observation that no other right of plaintiff on the tent can be derived. This could be formalised in Prakken and Sartor (1996) as a weakly negated statement, although this might not be the most natural formalisation.

-  $\pi_1$  stays out.

$\pi_6$ : *why* was I not owner at  $t_1$ ? (Target:  $\delta_3$ )

(Plaintiff tries to shift the burden of proof onto defendant. This move can be traced back to a general statement of plaintiff in his Reply (paragraph 5) that he is of the opinion that he has no burden of proof for his claims. In the protocol of Prakken (2008) move  $\pi_6$  is required to allow the judge to express an explicit burden allocation on the issue of whether (1) holds.)

-  $\delta_3$  is made out, but since defendant launched two further attacks on  $\pi_1$ , that move stays out.

$\pi_7$ : *why* dit I not involuntarily lose possession of the tent at  $t_1$ ? (Target:  $\delta_4$ )

(This move is also based on plaintiff's general statement in paragraph 5 of his reply.)

-  $\delta_4$  is made out.

$\iota_8$ : *burden*(1,  $\pi$ ) (Target:  $\pi_6$ )

(The judge assigns to plaintiff the burden of proving his ownership of the tent at  $t_1$ , on the basis of the general rule of the Dutch law of evidence that a party who claims a legal relation has to prove the facts inducing that relation (Section 177 Rv).)

-  $\pi_6$  is made out, which makes  $\delta_3$  in again.

$\iota_9$ : *burden*(4,  $\pi$ ) (Target:  $\pi_7$ )

(The judge assigns to plaintiff the burden of proving that he involuntarily lost possession of the tent at  $t_1$ . Again the judge here invokes Section 177 Rv.)

$\pi_{10}$ : *argue*  $A_3$  (14) My son occupied the tent at  $t_1$ , (15) I and my family held the tent in normal use from obtaining the tent to  $t_1$ , *so*, (16) I held the tent at  $t_1$ . *So*, by the presumption of 590 BW, (17) I had possession of the tent at  $t_1$ , *so*, by the presumption of 589 BW, (18) I had possession in good faith of the tent at  $t_1$ , *so*, by the presumption of 2014,1 BW, (1) I owned the tent at  $t_1$ . (Target:  $\delta_3$ )

(Plaintiff argues for his ownership at  $t_1$  with the above-explained cascade of three legal presumptions.)

-  $\delta_3$  is made out but to make  $\pi_1$  in two further attacks are needed.

$\pi_{11}$ : *argue*  $A_4$ : (19) 2014,2 BW is an exception to 2014,1 BW, *so*, by *Lex Specialis*, (20) 2014,2 BW prevails over 2014,1 BW. (Target:  $\delta_5$ )

(Plaintiff argues that, since defendant's counterargument  $A_2$  is based on a general rule while plaintiff's argument  $A_1$  is based on an exception, his argument prevails. This argument is implicit in Plaintiff's remarks in his Reply (paragraph 2) that he wants to "leave open" whether he agrees that defendant bought the tent, since that is irrelevant, since he has become the owner by 2014, 2 BW.

-  $\delta_5$  is also made out.

$\pi_{12}$ : *argue*  $A_5$ : (14) My son occupied the tent at  $t_1$ , (15) I and my family held the tent in normal use from obtaining the tent to  $t_1$ , (21) violent events at  $t_1$ , *so*, (4) I involuntarily lost possession of the tent at  $t_1$ . (Target:  $\delta_4$ )

(Plaintiff argues for involuntary loss of his possession of the tent by referring to the violent events.)

-  $\delta_4$  is also made out so now  $\pi_1$  becomes in.

$\delta_{13}$ : *concede* (14) Plaintiff's son occupied the tent at  $t_1$ . (Target:  $\pi_{12}$ )  
(Defendant concedes that plaintiff's son occupied the tent at the time of the violent events. Whether defendant has actually conceded this claim is a matter of interpretation. I have based my interpretation on his statement in the Rejoinder that 'I have heard people saying that plaintiff had obtained the tent on loan from van der Velde and had not bought it from him').

-  $\pi_{12}$  stays in.

$\delta_{14}$ : *concede* (14) Plaintiff's son occupied the tent at  $t_1$ . (Target:  $\pi_{10}$ )  
(Defendant repeats his concession in reply to  $\pi_{10}$ , since that move used the same premise in a different argument. In reality defendant did not repeat this move: the repetition is required by the formal framework, which does not allow 'global' concessions or disputations of propositions but requires them to be targeted at specific usages of the propositions (unlike, for example, Walton and Krabbe (1995)).

-  $\pi_{10}$  stays in.

$\delta_{15}$ : *why* (21) Violent events at  $t_1$  (Target:  $\pi_{12}$ )  
(That defendant disputes that the violent events occurred is my interpretation of the fact that defendant in his Rejoinder says "I deny the rest of what plaintiff has said in his *Reply* because of lack of knowledge").

-  $\pi_{12}$  is made out which makes  $\delta_4$  in and so  $\pi_1$  out.

$\delta_{16}$ : *argue*  $A_6$ : (22) Nieborg obtained the tent on loan from V., *so*, (23) Nieborg started holding the tent for someone else, *so* (24), the assumption of 590 BW to the contrary is false. (Target:  $\pi_{10}$ )

(Nieborg argues that the exception to the presumption of 590 BW applies.)

-  $\pi_{10}$  is also made out.

$\delta_{17}$ : *argue*  $A_7$ : (25)  $t_1$  is in the past, (26) 2014, 1 BW does not apply to past events, *so* (27) 2014, 1 BW is not applicable. (Target:  $\pi_{10}$ )

(Defendant argues against plaintiff's retrospective use of 2014, 1 BW. In the case files defendant actually expressed this argument as: "An appeal to 2014, 2 BW can only be made by the owner, not by the holder. Therefore, plaintiff has to prove his ownership.". This is quite elliptic. The fairest way of interpreting it in light of the relevant law seems: *If a fact of possession in good faith is in the past, then 2014, 1 BW does not apply to the fact. Plaintiff claims that he was in possession of the tent in good faith in the past, therefore, 2014, 1 BW does not apply to his claim. Therefore, plaintiff's argument for his ownership based on the cascade of presumptions fails and plaintiff must prove ownership in an 'ordinary' way*'. The final sentence is in fact a metalevel observation on the consequences of defendant's inapplicability argument on the dialogical state of the dispute, and is therefore left out of the argument.)

-  $\pi_{10}$  stays out.

$\pi_{18}$ : *argue*  $A_8$ : (28) premises, *so* (29) 2014, 1 BW also applies to past events.

(Plaintiff rebuts defendant's interpretation argument. The premises are not made explicit since this debate was in fact conducted in the intermediate appeal stage on the judge's initial allocations of the burden of proof, which implicitly accepted defendant's argument  $A_7$ . As described above, the Dutch High Court overturned this decision and accepted Plaintiff's argument.)

-  $\delta_{17}$  is made out.

$\pi_{19}$ : *why* did the violent events not occur at  $t_1$ ? (Target:  $\delta_{15}$ .)  
 (This move is also based on plaintiff's general statement in paragraph 5 of his reply.)  
 -  $\delta_{15}$  is made out so  $\pi_{10}$  becomes in, but since  $\pi_{10}$  is still out,  $\pi_1$  stays out.

$\pi_{20}$ : *why* (22) did I obtain the tent on loan from V.? (Target:  $\delta_{16}$ )  
 (This move is also based on plaintiff's general statement in paragraph 5 of his reply.)  
 -  $\delta_{16}$  is made out which makes  $\pi_{10}$  and so  $\pi_1$  in.

$\iota_{21}$ : *burden*(21,  $\pi$ ) (Target:  $\pi_{19}$ )  
 (The judge assigns the burden of proving (21) to plaintiff.)  
 -  $\pi_{19}$  is made out so  $\delta_{15}$  is made in and  $\pi_{12}$  out, which makes  $\delta_4$  in and and  $\pi_1$  out.

$\delta_{22}$ : *why* did you not obtain the tent on loan from V.? (Target:  $\pi_{20}$ )  
 -  $\pi_{20}$  and  $\pi_{10}$  also become out.

$\iota_{23}$ : *burden*(22,  $\delta$ ) (Target:  $\delta_{22}$ )  
 (The judge allocates the burden of proving the exception (22) to defendant.)  
 -  $\delta_{22}$  is made out which makes  $\pi_{10}$  in and  $\delta_3$  out, but  $\pi_1$  stays out since its other attacker  $\delta_4$  is still in.

The last move has induced a switch of the dialectical roles in the underlying logical argument game (see Prakken (2001a): defendant has become proponent and plaintiff has become opponent with respect to  $A_6$ . This means that, as far as the argument game about  $A_6$  is concerned, defendant's counterarguments have to strictly defeat their target, while plaintiff's arguments may weakly defeat their target. In more legal terms: the judge must become convinced that plaintiff obtained the tent on loan from van der Velde; it is not enough for defendant if the judge is not convinced that plaintiff did not obtain the tent on loan from van der Velde.

On the other hand, with respect to the issue of the violent events, plaintiff is the proponent while defendant is the opponent.

The discussion in the claim phase on the legal issues has now ended. Figure 1 in the appendix displays the reply structure of the dialogue so far and the dialogical status of all its moves. (In this figure grey coloured moves are in while white-coloured moves are out. The moves  $\pi_{24}$  and  $\delta_{26}$  from the decision phase have been added to show how the dialogue will continue in that phase.) That section also contains various charts displaying the arguments exchanged thus far (Figures 4, 5, 6, 7 and 8). In terms of Prakken (2005a, 2008) these figures display the argument graph associated with the dialogue upto this stage. If the logic of Prakken and Sartor (1996) is applied to all these arguments (displayed together in Figure 8), then plaintiff's main argument (Figure 4, consisting of  $A_1 + A_3 + A_5$ ) is overruled, since it is undercut by a non-attacked argument, viz.  $A_6$ . The defended part of the argument graph consists of only  $A_2$ ,  $A_4$ ,  $A_7$  and  $A_8$ , since  $A_1 + A_3 + A_5$  has a disputed premise (21) while  $A_6$  has a disputed premise (22). The defended part does not contain an argument for plaintiff's main argument, which agrees with the dialogical status of  $\pi_1$  at this stage, which is out.

Note that  $\pi_1$  is out since  $\delta_4$  is in. In the following phase, in which evidence is provided for the claims to be proven, plaintiff will try to make it in by providing an evidential argument for (21) that he lost the tent by the violent events. If this succeeds and defendant does nothing, then  $\delta_{15}$  is made out so that  $\pi_{12}$  becomes in, which makes  $\delta_4$  out, which makes  $\pi_1$  in. Defendant's strategy, on the other hand, is to make his other attack on  $\pi_1$ , which is  $\delta_3$ , in, by providing an evidential argument for (22) that Nieborg obtained the tent on loan which, if successful, makes  $\delta_{16}$  in, which makes  $\pi_{10}$  out, which



makes  $\delta_3$  in and so  $\pi_1$  out.

## 6.2 Discussing the evidence in the pleadings phase

Thus far, the reconstruction was based on the first four documents of the adversaries and the judge's intermediate verdict in which he allocated the burden of proof (recall that the complication with the appeal phase is ignored.) In that phase, the adversaries did not yet provide evidence. This happened following the intermediate verdict, when the parties called witnesses, which they interrogated under supervision of the judge. The witness testimonies were recorded as if they were monologues of the witnesses. Following the witness examinations, the adversaries exchanged two more documents, in which they argued that each had himself fulfilled their proof burden while the other party had not. The case was then concluded with the court's final verdict. It is important to note that Dutch Civil procedure leaves the judge fully free to assess the evidentiary relevance and force of the witness testimonies.

In this concluding phase the nature of the discussion changes. No legal claims are made any more, and the discussed facts are not 'legal operative' facts, i.e., facts such that, if proven, immediately warrant a legal conclusion (such as 'van der Velde sold the tent to Nieborg' or 'The work done by Mr. and Mrs. Nieborg for van der Velde was payment for the tent'). Instead they are 'evidentiary' facts, which are meant to prove the legal operative facts earlier claimed by the parties. The only issue in this phase is whether the evidence (i.e., the witness testimonies) supports the claims of the adversaries for which they have the burden of proof. In fact, the judge may use any 'procedural' fact observed by him- or herself during the case, such as the fact that a witness said something, or a physical piece has a certain appearance. Consequently, the discussion largely proceeds by exchanging arguments, counterarguments and priority arguments. Ideally, the premises of the adversaries' arguments in this phase should all be evidential. However, we will see that this was not the case.

In his decision, the judge does not need to respond to the evidential arguments of the adversaries. In the present case, the judge simply puts his argument in place of that of the winner (defendant), and responds to some of plaintiff's counterarguments against defendant's argument that also attack the judge's arguments, but he ignores other counterarguments.

An important modelling decision has to be made concerning accrual of arguments. In all arguments below the various appeals to witness testimonies for the same conclusion arguably are not simply conjoined but are accrued. In other words, each individual testimony is regarded as a reason for the conclusion drawn from it, so each testimony gives rise to a separate argument based on the witness testimony scheme. These arguments, which all have the same conclusion, are then accrued into a new argument for the same conclusion, reflecting that by default it is better to have more arguments for the same conclusion. Accruals are assumed to be modelled as in Prakken (2005b). In the arguments below (except the first) I will leave the accrual step implicit for the sake of brevity.

I now first reconstruct plaintiff's attempt to fulfill his burden of proof. As said above, it was never controversial that he had violently lost possession of the tent, and he easily proved this with three witness statements. For purpose of illustration I represent the argument with an implicit accrual step, labelling each individual conclusion with its premises and then unlabelling the three versions of the same conclusion with the accrual inference rule of Prakken (2005b).

$\pi_{24}$ : *argue*  $A_9$  (30) Witness Visser reports about the violent events at  $t_1$ , so (21a) Violent events at  $t_1$ <sup>{30}</sup>. (31) Witness Schepel reports about the violent events, so

(21b) Violent events at  $t_1^{\{31\}}$ . (32) Witness Schepel-De Vries reports about the violent events *so* (21c) Violent events at  $t_1^{\{32\}}$ . *So*, by accrual, (21) Violent events at  $t_1$ . (Target:  $\delta_{15}$ )

(This move is implicit in paragraph 1 of plaintiff's Reply, in which he observes that even defendant concedes that plaintiff has fulfilled his burden of proof. )

-  $\delta_{15}$  is made out and thus  $\pi_{12}$  is made in, which makes  $\pi_1$  in.

$\delta_{25}$ : *concede* (21) violent events. (Target:  $\pi_{12}$ ).

(Defendant is convinced by plaintiff's evidence and therefore concedes plaintiff's claim (21), backtracking to his earlier disputation  $\delta_{15}$ .)

-  $\pi_{12}$  stays in.

I next reconstruct defendant's argument in fulfillment of his burden to prove that plaintiff obtained the tent on loan. According to the applicable law the three 'legal-operative' facts that must be established to prove this claim are that the tent was (33) given in use which was (34) free and (35) temporary. In his main argument, defendant's solicitor does not clearly distinguish these three grounds, and she neither ties her argument to specific quotes from the testimony records. Therefore, my formalisation of her argument is to a large extent a reconstruction of the actual argument. This, for instance, holds for part V7 of van der Velde's testimony. This was referred to by the defence but not clearly as a reason for a particular conclusion.

I now paraphrase the argument (recall that the various accruals of the testimonies are left implicit).

$\delta_{26}$ : *argue*  $A_{10}$ : The tent was (33) given in use as proven by van der Velde's testimony, who says so (V1,V2), and by Gjaltema (G1) and van der Sluis's (S1,S3) testimonies, who both reported that Nieborg had told them so. The use was (34) free as proven by the following testimonies: van der Velde (V2) says so; furthermore, van der Velde (V3) says that Nieborg had expressed his gratitude towards him; both Gjaltema (G1) and van der Sluis (S1,S2) declare that Nieborg had expressed to them the same gratitude towards van der Velde; van der Sluis added to this that Nieborg had said to him that this made it possible for him and his wife to go on holiday since they had no money to go on holiday. The use was (35) temporary as proven by the following testimonies: van der Velde (V1,V2) says so; van der Sluis (S3) states that Nieborg had told him that the reason why van der Velde had given him the tent in use was that that summer van der Velde did not have time himself to use it. *So*, (22) Nieborg obtained the tent on loan from van der Velde. (Target:  $\pi_{20}$ )

-  $\pi_{20}$  is made out which makes  $\delta_{16}$  in so  $\pi_{10}$  out so  $\delta_3$  in so  $\pi_1$  out.

All premises of this argument can be backed by citations from the witness testimony records (indicated by the Vs,Gs and Ss), so this is a genuine evidentiary argument. Note also that the argument combines applications of the argument scheme from witness testimony with applications of implicit legal classification rules and an implicit statutory rule.

I now turn to plaintiff's attack on defendant's proof of the loan. He starts in paragraph 3 of his Reply with a counterargument of  $A_{10}$  that completely misrepresents defendant's argument so that it is not worth being reconstructed here. Then plaintiff has two serious lines of attack. Firstly, he argues that the work Mr. and Mrs. Nieborg had done for van der Velde was payment of the sales price; this attacks the subargument of  $A_8$  that the tent was given in use for free. Plaintiff's second line of attack is to cast doubt on the sincerity of the three defence witnesses. I have reconstructed this as an

undercutter of all arguments that make use of any defence witness statement.

$\pi_{27}$ : *argue*  $A_{11}$ : (36) as an expression of gratitude the work of Mr. and Mrs. Nieborg is excessive, (37) van der Velde accepted the same kind of work as payment by van der Weg just a few months later, (38) even van der Velde in his testimony (V4) admits that the work is related to the giving of the tent, *so*, (39) the work of Mr. and Mrs. Nieborg was payment for the tent, *so*, (40) the tent was not given in use for free. (Target:  $\delta_{26}$ ).  
-  $\delta_{26}$  is made out *so* (recursively)  $\pi_1$  is in again.

$\pi_{28}$ : *argue*  $A_{12}$ : (41) this is a ticket for a Rheinfahrt of Mr. and Mrs. Nieborg in 1974, *so*, (42) Mr. and Mrs. Nieborg have been on holiday in 1974; (43) Mr. and Mrs. Nieborg have been on holiday on several other occasions, *so*, (44) Mr. and Mrs. Nieborg have been on holiday on several occasions; (V3) van der Velde testified that Nieborg had told him he and his wife could not go on holidays, *so*, (45) van der Velde has testified something that was not true; furthermore, (46) van der Velde has an interest in a win of van der Weg in this case, (47) the law declares witnesses with lesser interests than van der Velde as unfit for being a witness, *so* (by 45,46,47), (48) van der Velde is not sincere. (Target:  $\delta_{26}$ ).  
-  $\delta_{26}$  stays out *so*  $\pi_1$  stays in.

$\pi_{29}$ : *argue*  $A_{13}$ : (49) Gjaltema and van der Sluis do not say much, (50) they declare that Nieborg had told them he and his wife could not go on holidays, (51) this is a ticket for a Rheinfahrt of Mr. and Mrs. Nieborg in 1974, *so*, (42) Mr. and Mrs. Nieborg have been on holiday in 1974; (43) Mr. and Mrs. Nieborg have been on holiday on several other occasions; *so* (44) Mr. and Mrs. Nieborg have been on holiday on several occasions, *so*, (52) Gjaltema and van der Sluis have testified something that was not true, *so*, (by 49 and 52) (53) Gjaltema and van der Sluis are not sincere. (Target:  $\delta_{26}$ ).  
-  $\delta_{26}$  stays out *so*  $\pi_1$  stays in.

To comment on plaintiff's attacks on the witnesses' sincerity, his attempt to show that the witnesses lied in their testimonies seems clearly inconclusive, since the witnesses did not testify that Nieborg had never been on holiday, only that Nieborg had told them *so*; this leaves open the possibility that Nieborg had not told them the truth. However, the judge made no use of this argument. Note also that, while premise (42) is backed by a copy of the ticket, premise (43) is not backed by any evidence.

Besides these two main lines of attack, plaintiff also made two minor comments in reply to defendant's main argument. The first is that witness Gjaltema explicitly testified that he did not know (when helping Nieborg to build the tent) whether Nieborg had obtained it on loan. I reconstruct this as a separate undercutter of any use of Gjaltema's testimony, arguing that this witness was not in the position to know about what he testified. This may seem too strong, but in the present, logical setting this seems the only way not to ignore this attack. Note that Gjaltema's comment cannot be regarded as evidence against his sincerity. The second comment is that the true reason for van der Velde's anger when Nieborg told him he had paid enough for the tent was that van der Velde was dissatisfied with the quality of Nieborg's painting work. Note that this claim is not backed by evidence. I have reconstructed these attacks as an undercutter of defendant's use of premise V7 in  $A_{10}$  on the grounds that the witness used in this argument is not sincere (strictly speaking this accrue with the other arguments against van der Velde's sincerity but in the case documents these arguments are made in quite different places).

$\pi_{30}$ : *argue*  $A_{14}$ : (54) Gjaltema testifies that that he did not know (when helping Nieborg

to build the tent) whether Nieborg had obtained it on loan, *so*, (55) Gjaltema was not in the position to know about (33). (Target:  $\delta_{26}$ )

(In fact, the conclusion was not explicitly stated as such but in combination with  $A_{13}$  as “the reliability of the statements of Gjaltema and van der Sluis is therefore doubtful” I have chosen to separate the two arguments since (49-51) and (54) pertain to different critical questions of the witness testimony scheme). -  $\delta_{26}$  stays out so  $\pi_1$  stays in.

$\pi_{31}$ : *argue*  $A_{15}$ : (V7) Van der Velde says that he had become very angry when Nieborg had told him that he and his wife had now done enough work to pay for the tent, since van der Velde had never meant to sell the tent; (56) the true reason for van der Velde’s anger was his dissatisfaction with Nieborg’s work, *so*, (57) van der Velde is not sincere. (Target:  $\delta_{26}$ ).

(In fact, plaintiff only stated the premises so that the conclusion is a matter of interpretation.) -  $\delta_{26}$  stays out so  $\pi_1$  stays in.

The defence anticipated plaintiff’s argument that the work of Mr. and Mrs. Nieborg was payment, and provided the following counterargument.

$\delta_{32}$ : *argue*  $A_{16}$ : the work of Mr. and Mrs. Nieborg was no payment since it was done out of gratitude, as proven by the following witness testimonies: van der Velde’s testimony, who says (V3) that Nieborg expressed his gratitude, and (V4) that he offered to do the work after accepting the tent, and (V5) that he would also have offered the tent without Nieborg’s counterservice, and (V7) by his anger after Nieborg had told him they had done enough to pay the tent; by Gjaltema (G1) and van der Sluis (S1,S2), who both declare that Nieborg had expressed to them his gratitude towards van der Velde. (Target:  $\pi_{27}$ ).

-  $\pi_{27}$  is made out but since  $\delta_{26}$  has four other attackers that are in, it stays out so  $\pi_1$  stays in.

This completes the reconstruction of the adversaries’ arguments.

### 6.3 The decision phase

It is left to reconstruct the judge’s decision. According to Prakken (2008) we now enter the decision phase, in which only the judge moves and in which he only moves arguments, replying to any move he wants. The judge starts by repeating plaintiff’s argument  $A_9$  in fulfillment of his burden to prove the violent events (22) and defendant’s concession of this claim and then concludes from this that Nieborg has fulfilled his burden of proof. This can be regarded as a metalevel observation on the dialogical status of the relevant moves, so it will not be formally represented as an *argue* move. The judge’s decision concerning van der Weg’s burden is worth being cited in detail. After paraphrasing some of the witness testimonies, the decision continues as follows.

On the basis of the three witness testimonies of van der Velde, Gjaltema and van der Sluis, when considered jointly and in their mutual relations, the court regards as proven that Nieborg had at 5 July 1974 obtained the tent on loan. Although the witnesses do not use the term ‘bruikleen’ (the technical Dutch term for the loan of the tent, HP), this was not to be expected from legal laymen like a pub owner (van der Velde), a cattle trader (Gjaltema) and a plasterer (van der Sluis). The court regards as decisive that the witnesses speak of “to make use of” (van der Velde), “use” (Gjaltema) and “to give in use” (van der Sluis).

That the use of the tent was temporary is proven by the testimony of van

der Velde, when related to the use he speaks of “for some time”, and the testimony of van der Sluis, who mentions the period “the summer of 1974”.

That the use was free is proven by the testimony of van der Velde, who in this context explicitly uses the word “free”, combined with the gratitude shown by Nieborg as mentioned by all three witnesses and his remark to the witnesses Gjaltema and van der Sluis that receiving the tent made it possible for him and his wife to go on holiday that year.

This all holds notwithstanding the fact that witness van der Velde has a considerable interest in the rejection of plaintiff’s claim; witnesses more often have an interest in the outcome of a case. It should be noted that the law does not declare van der Velde inadmissible as a witness and in addition that his testimony is supported by those of witnesses Gjaltema and van der Sluis and, finally, that Nieborg has abstained from calling counterwitnesses.

(translated by HP).

I reconstruct this as follows. The first modelling decision is whether the phrase “when considered jointly and in their mutual relations” means that the judge has conjoined or accrued the various witness testimonies. I have (implicitly) chosen the accrual interpretation since it allows for a more natural representation of the judge’s treatment of the arguments against van der Velde’s sincerity (see Prakken (2005b) for a detailed explanation of this claim). However, this choice is debatable.

First the judge puts his main argument in place of defendant’s main argument  $A_{10}$ .

$\iota_{33}$ : *argue*  $A_{17}$ : (V2) witness van der Velde speaks of “to make use of”, witness Gjaltema (G1) of “use” and witness van der Sluis (S12) of “to give in use”, *so*, (33) the tent was given in use; furthermore, (V2) witness van der Velde speaks of “free” and (V3) Nieborg’s gratitude, witness Gjaltema (G1) and van der Sluis (S1,S2) both declare that Nieborg had expressed to them his gratitude towards van der Velde since he and his wife could now go on holiday, *so*, (34) the tent was given for free; furthermore, (V1,V2) witness van der Velde speaks of “for some time”, and witness van der Sluis of “during the summer of 1974”, *so*, (35) the tent was given in use temporarily, *so*, (22) Nieborg obtained the tent on loan from van der Velde. (Target:  $\pi_{20}$ )

- This move has the same effect as  $\delta_{26}$ : it makes  $\pi_{20}$  out, which makes  $\delta_{16}$  in *so*  $\pi_{10}$  out *so*  $\delta_3$  in *so*  $\pi_1$  out.

Note that plaintiff’s *argue* attacks on defendant’s main argument  $A_{10}$  are also attacks on the judge’s main argument. Therefore, in our reconstruction they must be repeated as such (but now moved by the judge).

$\iota_{34}$ : *argue*  $A_{11}$  (Target:  $\iota_{33}$ ).

$\iota_{35}$ : *argue*  $A_{12}$  (Target:  $\iota_{33}$ ).

$\iota_{36}$ : *argue*  $A_{13}$  (Target:  $\iota_{33}$ ).

$\iota_{37}$ : *argue*  $A_{14}$  (Target:  $\iota_{33}$ ).

$\iota_{38}$ : *argue*  $A_{15}$  (Target:  $\iota_{33}$ ).

- The first of these attacks makes  $\iota_{33}$  out *so* it (recursively) makes  $\pi_1$  in again, and the remaining attacks do not change this.

Finally, we must reconstruct the judge’s rejection of plaintiff’s counterarguments. In fact, the judge responds to only some of these arguments, viz. the attack on van der Velde’s sincerity and the attack based on Gjaltema’s ignorance. As for van der Velde’s sincerity, the judge first says that his interest in a win by defendant is not a reason for his insincerity (thus undercutting part of plaintiff’s argument  $A_{12}$ ). Then the judge

gives some positive reasons for van der Velde's sincerity.

$\iota_{39}$ : *argue*  $A_{18}$ : (58) witnesses more often have an interest in the outcome of a case, and (59) the law does not declare van der Velde inadmissible as a witness *so*, (60)  $A_{12}$  is inconclusive. (Target:  $\iota_{35}$ )

- This makes  $\iota_{35}$  out but  $\iota_{33}$  has four remaining attackers that are in.

$\iota_{40}$ : *argue*  $A_{19}$ : (61) van der Velde's statements are supported by Gjaltema and van der Sluis, (62) Nieborg has abstained from calling counterwitnesses, *so*, (63) van der Velde is sincere. (And  $r_{63} \succ r_{57}$ ) (Target:  $\iota_{35}$ )

-  $\iota_{35}$  was already out so nothing changes.

( $r_n$  denotes the rule with as consequent the statement numbered  $n$ ). The priority statement at the end of this argument says that the judge's commonsense rule for why van der Velde is sincere has priority over plaintiff's conflicting commonsense rule. According to Prakken and Sartor (1996) this is needed to make  $A_{19}$  strictly defeat  $A_{12}$ . It is arguably implicit in the judge's decision to use van der Velde's testimony. Note that here it is defendant's argument that must strictly defeat plaintiff's counterargument: this is because the judge's burden allocation in  $\iota_{23}$  has switched the dialectical roles of proponent and opponent with respect to the issue whether Nieborg obtained the tent on loan.

In fact, argument  $A_{19}$  must be repeated in attack of  $A_{15}$  as moved in  $\iota_{38}$ , since that argument also concludes that van der Velde is not sincere.

$\iota_{41}$ : *argue*  $A_{19}$ : (61) van der Velde's statements are supported by Gjaltema and van der Sluis, (62) Nieborg has abstained from calling counterwitnesses, *so*, (63) van der Velde is sincere. (And  $r_{63} \succ r_{57}$ ) (Target:  $\iota_{38}$ )

- This makes  $\iota_{38}$  out but  $\iota_{33}$  has three remaining attackers that are in.

The judge must therefore consider three more attacks, namely,  $\iota_{34}$  (that the use was not free since Nieborg and his wife had paid for it),  $\iota_{36}$  (that Gjaltema and van der Sluis are insincere) and  $\iota_{37}$  (that Gjaltema was not in the position to know about (33)). Note that the judge does not explicitly respond to any of these arguments. From a legal point of view this is understandable, since Dutch civil procedure does not require the judge to explicitly respond to the adversaries' evidential arguments. However, it might be argued that this omission is a rational flaw in her decision, which raises the issue to which degree legal procedures should incorporate standards of rationality.

$A_{11}$  in  $\iota_{34}$  rebuts and is rebutted by the subargument for (34) of  $A_{17}$  as moved in  $\iota_{33}$ . So according to our formal dialogue system  $\iota_{34}$  can be attacked by a priority argument to the effect that  $A_{11}$  does not defeat the subargument of  $A_{17}$  for (34). Arguably, such a priority argument can be regarded as implicit in the judge's use of  $A_{17}$ 's subargument for (34). Accordingly, it has an uninteresting unconditional rule premise.

$\iota_{42}$ : *argue*  $A_{20}$ :  $\Rightarrow r_{34} \succ r_{40}$ , *so*  $r_{34} \succ r_{40}$  (Target:  $\iota_{34}$ )

- This makes  $\iota_{34}$  out but  $\iota_{33}$  has two remaining attackers that are in.

The two remaining arguments are not rebuttals but undercutters of  $A_{17}$ . Of course, we could say that the judge's use of all three witness testimonies contains an implicit rejection of these undercutters. These rejections would have to be formalised as rebuttals: the rejection of  $A_{13}$  should have a conclusion 'Gjaltema and van der Sluis are sincere' and the rejection of  $A_{14}$  should have the conclusion 'Gjaltema was in the posi-

tion to know about (33)’. Moreover, these rebuttals should be combined with priority arguments to the effect that the rejections strictly defeat their target (as in  $A_{20}$  moved in  $\iota_{42}$ ). However, I have chosen not to interpret the judge’s decision in this way, since he explicitly addresses the attacks on van der Velde’s sincerity and, moreover, he argues for van der Velde’s sincerity by saying that his testimony is supported by those of Gjaltema and van der Sluis. For this reason their suitability as witnesses is an essential ingredient of the cases (the more so since throughout the case dossier the plaintiff implicitly suggests that the three witnesses had conspired). Here the judge’s reasoning seems clearly flawed or at least incomplete.

Finally, we must model the judge’s remark concerning the fact that the witnesses do not use the term “bruikleen”. Since defendant never explicitly said this, this is in fact, an example of ‘internal dialectics’. One way to model this is as follows. First the judge formulates a rebuttal of his argument  $A_{17}$  in  $\iota_{33}$ .

$\iota_{43}$ : *argue*  $A_{21}$ : (64) witness van der Velde does not speak of “bruikleen”, (65) witness Gjaltema does not speak of “bruikleen”, (66) witness van der Sluis does not speak of “bruikleen”; *so*, (67) the tent was not given in use. (Target:  $\iota_{33}$ )  
 -  $\iota_{33}$  was already out so nothing changes.

(Note that the system of Prakken (2008) allows the judge to attack his own arguments in the decision phase.) Then the judge undercuts this argument as follows:

$\iota_{44}$ : *argue*  $A_{22}$ : (68) van der Velde is a pub owner, (69) Gjaltema is a cattle trader, (70) van der Sluis is a plasterer, *So* (71) the witnesses are legal laymen, *so*, (72)  $A_{18}$  is inconclusive. (Target:  $\iota_{42}$ )  
 (The conclusion of this argument is shorthand for the conclusion that the commonsense rule used in  $A_{18}$  (which is left implicit in that argument), is not applicable to this case.)  
 - This makes  $\iota_{42}$  out but  $\iota_{33}$  still has its two remaining attackers that are in.

$\iota_{45}$ : *terminate*

Figure 2 in the appendix displays the reply structure of the ‘evidential’ part of the dialogue, while Figure 3 shows the resulting changes in dialogical stauts of the first part of the dialogue and various other charts visualise the argument graph associated with the dispute. As can be seen from Figure 3, plaintiff’s initial claim  $\pi_1$  is now in; yet in the actual case the judge has found for defendant. The reason for this discrepancy is, as explained above, that the judge has failed to address two attacks on witness statements that the judge uses in his main argument.

## 7 Discussion

The main conclusions to be drawn from our reconstruction are as follows. As for whether the dialogue system of Prakken (2008) is suitable for modelling the dispute, a distinction must be made between the *protocol* and the *reply structure* of the communication language. The protocol rules of the formal model turned out not to correspond to what Dutch civil procedure says on the allowed procedural moves. In particular, the Dutch procedure states only few conditions on the argumentative and dialogical structure of the documents, and it defines turn taking and termination without looking at the dialogical status of a dispute.

Therefore, the formalism can better be seen as regulating a *rational reconstruction* of the case by an outside observer. In fact, such a rational reconstruction can also

be made by a judge who accepts the formal system as a rationality standard for her decision. She can use it when she must decide the case after pleadings have ended. In the decision phase the judge ideally reconstructs the dispute of the pleadings phase into a dialectical structure from which she can determine the decision. She will identify the argumentative speech acts made by the parties in the pleadings phase, determine whether they were allowed according to Dutch civil procedure, and reconstruct how they logically and dialogically relate to each other. The judge will ideally also complete the adversaries' arguments with the applicable law, and then express her decision by adding her own arguments, counterarguments and priority arguments.

It turned out that for a 'post-hoc' application of the formal system, the protocol was less important than the reply structure on the communication language and the notion of dialogical status, which turned out to be largely adequate. As for the locutions expressed in the case files, it was by and large possible to model them in terms of the formal communication language, with the possible exception that in a few cases the adversaries spoke of "denying" a statement, which arguably is a claim of the negation of the statement. However, the formal dialogue system does not allow for such counter-claims if they are not combined with an argument, and therefore I have in such cases formalised the denials as just a *why* move.

As for the structure of the dialogue, the formal reconstruction has resulted in a dialogue tree that on the whole adequately reflects the attacking and surrendering relations between the locutions expressed in the case file. Moreover, the dialogue tree has induced an associated argument graph which gives a largely adequate representation of the constructed arguments and their dialectical relations. However, in two respects the dialogue tree does not fully faithfully model the dialogue.

Firstly, what did not quite fit the formalism was the fact that the judge in his final decision simply replaced defendant's main argument by his own deciding argument. In fact, Dutch civil procedure allows the judge to disregard to a large extent the adversaries' arguments and to concentrate on their legal claims and their evidence provided in support of their claims: it is the judge's task to provide the legal and factual arguments leading from the evidence to the legal claims. In the present case the judge, after finding for defendant, responded to some but not all of plaintiff's counterarguments to defendant's main argument. Therefore, the dialogical status of the main claim in the end was *in*, which does not correspond with the fact that defendant won the dispute. This arguably illustrates a benefit of a formal model of dialogue: it can reveal that the judge's decision is sometimes rationally incomplete. More generally this raises the issue to which extent legal procedures should incorporate standards of rationality.

Secondly, the requirement of the formal system that each attacking or surrendering move explicitly replies to a unique earlier move in some cases requires that the formalisation repeats moves where in the actual dialogue they were stated only once. This holds, for instance, for concessions or disputations of statements that occur in more than one argument (see  $\delta_{13}$  and  $\delta_{14}$ ) and for counterarguments that attack premises or conclusions that occur in more than one argument (as in  $\iota_{34} - \iota_{38}$ ). (Systems like those of Walton and Krabbe (1995) and Gordon (1994), which model most protocol rules in terms of the participants' commitments, do not have this problem but at the expense of being unable to model obvious dialogical relations between moves.) However, if the formal system is used as a post-hoc analysis tool, this is less of a problem than if it is used for actually regulating dialogues (e.g. in automated mediation systems). The same holds for moves that were not actually made or that were reconstructed to fit a certain formal format, as in, for example,  $\pi_6$ ,  $\iota_{41}$  and  $\iota_{42}$ .

This leads to what is perhaps the most important general conclusion from the case study, namely, that dialogue systems like the present one seem better suited as an analysis tool than as a tool for regulating disputes. In my opinion, this also holds for



all other dialogue models thus far proposed in the AI & Law literature, such as Gordon (1994); Hage et al. (1994); Lodder (1999); Bench-Capon et al. (2000). As a regulatory model, they seem suited for direct, face-to-face debates or perhaps for human-computer dialogues (e.g. in intelligent tutoring systems). Legal disputes, by contrast, (especially the written ones of civil procedure), seem closer to scholarly and investigative disputes.

As for the process of formally representing a real legal dispute, the main lesson learned is that it is not trivial to agree on what is the best formal modelling, since the case contains many ambiguities and leaves much implicit. Some specific interpretation problems were already discussed in Section 6 and in a (Prakken; 2002) I already reported on the occurrence of incomplete arguments in the case and on the problem of determining their best completion. Another interpretation problem was that some arguments of the adversaries were clearly legally ‘clumsy’. I have chosen to reconstruct them in their legally correct way; this seems justified by the above-mentioned feature of Dutch civil procedure that it is the judge’s and not the adversaries’ responsibility to formulate the legal arguments. A final interpretation problem was that, especially in the dispute about factual matters, it was unclear whether multiple reasons were advanced as alternative, accruing or conjunctive grounds for the factual claims (the same was found by Sombekke et al. (2007), who analysed another Dutch civil dispute on its argumentative structure).

As for the underlying logic, all types of arguments could be formalised in an arguably natural way. The logic of Prakken and Sartor (1996); Prakken (1997) turned out to be suitable for modelling arguments using defeasible rules (whether legal or commonsense), and arguments about rule priority and applicability of rules. The adaptation of these logics in Prakken (2001a) sufficed to model a switch in dialectical roles induced by the judge’s allocation of the burden of proof. The techniques of Prakken (2005b) could be used to model the accrual of arguments in the evidentiary phase (although, as said above, this requires an adaptation of the logic of Prakken and Sartor (1996)). Finally, the use of presumptions could be naturally modelled as reasoning with conditional defeasible rules in the way advocated by Prakken and Sartor (2006). On the other hand, the case arguably contains one type of argument that could not be directly modelled in these logics, namely,  $A_{15}$ , which arguably is an abductive argument offering an alternative explanation for van der Velde’s anger referred to in  $A_{10}$ . However, this issue did not play a role in the judge’s decision. Finally, as already said in the introduction, the case does not contain sophisticated case-based reasoning or theory-formation arguments. (By contrast, Sombekke et al. (2007) found many references to precedents in arguments on the classification of factual patterns of behaviour under evaluative legal concepts.)

The reader may perhaps not immediately agree with my overall conclusion that my formal reconstruction has largely been a natural representation of the dispute. Since natural-language use is often ambiguous and leaves much explicit, every formal reconstruction of a case has a subjective element and may be influenced by theoretical bias. In a few cases this was even deliberate. For instance, the arguments  $A_{12} - A_{15}$ , which all attack the use of a witness statement, have deliberately been given a conclusion in terms of the critical questions of the argument scheme listed in Section 5. Moreover, certain arguments have been deliberately formalised as inapplicability or priority arguments to make them fit the logic of Prakken and Sartor (1996). However, given that the representation was aimed to be a rational reconstruction, I think that such theoretical bias is not a problem as long as it is made explicit. I hope that this report will inspire other researchers to model the case in their own favoured formalisms, so that the results can be compared.

## References

- Bench-Capon, T., Geldard, T. and Leng, P. (2000). A method for the computational modelling of dialectical argument with dialogue games, *Artificial Intelligence and Law* **8**: 233–254.
- Garssen, B. (2001). Argument schemes, in F. H. van Eemeren (ed.), *Crucial Concepts in Argumentation Theory*, Amsterdam University Press, Amsterdam, pp. 81–99.
- Gordon, T. (1994). The Pleadings Game: an exercise in computational dialectics, *Artificial Intelligence and Law* **2**: 239–292.
- Hage, J. (1997). *Reasoning With Rules. An Essay on Legal Reasoning and Its Underlying Logic*, Law and Philosophy Library, Kluwer Academic Publishers, Dordrecht/Boston/London.
- Hage, J., Leenes, R. and Lodder, A. (1994). Hard cases: a procedural approach, *Artificial Intelligence and Law* **2**: 113–166.
- Kowalski, R. and Toni, F. (1996). Abstract argumentation, *Artificial Intelligence and Law* **4**: 275–296.
- Leclerq, W. (1990). *Procesdossiers: Civiel Proces*, Ars Aequi Libri, Nijmegen. (in Dutch).
- Leenes, R. (1998). *Hercules of Karneades: Hard Cases in Recht en Rechtsinformatica*. (Hercules or Karneades: hard cases in law and legal informatics), Twente University Press, Enschede. (In Dutch).
- Leenes, R. (2001). Burden of proof in dialogue games and Dutch civil procedure, *Proceedings of the Eighth International Conference on Artificial Intelligence and Law*, ACM Press, New York, pp. 109–118.
- Lodder, A. (1999). *DiaLaw. On Legal Justification and Dialogical Models of Argumentation*, Law and Philosophy Library, Kluwer Academic Publishers, Dordrecht/Boston/London.
- Pollock, J. (1995). *Cognitive Carpentry. A Blueprint for How to Build a Person*, MIT Press, Cambridge, MA.
- Prakken, H. (1997). *Logical Tools for Modelling Legal Argument. A Study of Defeasible Argumentation in Law*, Law and Philosophy Library, Kluwer Academic Publishers, Dordrecht/Boston/London.
- Prakken, H. (2001a). Modelling defeasibility in law: logic or procedure?, *Fundamenta Informaticae* **48**: 253–271.
- Prakken, H. (2001b). Modelling reasoning about evidence in legal procedure, *Proceedings of the Eighth International Conference on Artificial Intelligence and Law*, ACM Press, New York, pp. 119–128.
- Prakken, H. (2002). Incomplete arguments in legal discourse: a case study, *Legal Knowledge and Information Systems. JURIX 2002: The Fifteenth Annual Conference*, IOS Press, Amsterdam etc, pp. 93–102.
- Prakken, H. (2005a). Coherence and flexibility in dialogue games for argumentation, *Journal of Logic and Computation* **15**: 1009–1040.

- Prakken, H. (2005b). A study of accrual of arguments, with applications to evidential reasoning, *Proceedings of the Tenth International Conference on Artificial Intelligence and Law*, ACM Press, New York, pp. 85–94.
- Prakken, H. (2008). A formal model of adjudication dialogues, *Technical Report UU-CS-2008-31*, Department of Information and Computing Sciences, Utrecht University, Utrecht.
- Prakken, H. and Sartor, G. (1996). A dialectical model of assessing conflicting arguments in legal reasoning, *Artificial Intelligence and Law* **4**: 331–368.
- Prakken, H. and Sartor, G. (2006). Presumptions and burdens of proof, in T. M. v. Engers (ed.), *Legal Knowledge and Information Systems. JURIX 2006: The Nineteenth Annual Conference*, IOS Press, Amsterdam etc., pp. 21–30.
- Prakken, H. and Sartor, G. (2007). Formalising arguments about the burden of persuasion, *Proceedings of the Eleventh International Conference on Artificial Intelligence and Law*, ACM Press, New York, pp. 97–106.
- Reed, C. and Rowe, G. (2004). Araucaria: Software for argument analysis, diagramming and representation, *International Journal of AI Tools* **13**: 961–980.
- Schum, D. (1994). *Evidential Foundations of Probabilistic Reasoning*, Northwestern University Press, Evanston. Illinois.
- Sombekke, J., van Engers, T. and Prakken, H. (2007). Argumentation structures in legal dossiers, *Proceedings of the Eleventh International Conference on Artificial Intelligence and Law*, ACM Press, New York, pp. 277–281.
- Walton, D. (1996). *Argumentation Schemes for Presumptive Reasoning*, Lawrence Erlbaum Associates, Mahwah, NJ.
- Walton, D. and Krabbe, E. (1995). *Commitment in Dialogue. Basic Concepts of Interpersonal Reasoning*, State University of New York Press, Albany, NY.

## Appendix: Charts

In this appendix various charts are presented that visualise the dispute and the arguments exchanged. Figures 1 and 2 (made with Visio) visualise the reply structure and dialogical status of the dispute in, respectively, the phases where the legal and the evidential claims are discussed. Figure 3 shows how after the ‘evidential’ discussion the dialogical status of the ‘claim’ discussion has been changed. The remaining charts (all made by Araucaria 3.1 Reed and Rowe (2004)) provide various visualisations of the arguments that were incrementally constructed during the dialogue. In the Araucaria charts some compromises had to be made, since Araucaria does not support explicit visualisations of undercutting, inapplicability and priority attacks. These attacks have been visualised as attacks on the conclusion of the attacked argument. The Araucaria charts also contain an element not made explicit in the above representation, viz. a visualisation of the names of the argument schemes implicitly used in the arguments. Within Araucaria I have defined and visualised five such schemes, namely, statutory rule application, counts-as rule application (for classification and interpretation arguments), default rule application (for applications of empirical generalisations), and the above-mentioned schemes from witness testimony and temporal persistence.

Figure 4 shows plaintiff’s main argument in the claim discussion, while Figure 5 joins it with defendant’s main counterargument. Then Figure 6 shows defendant’s other attacks on plaintiff’s main ‘claim’ argument. Figure 7 does the same conversely for plaintiff’s secondary attacks on defendant’s main argument. Figure 8 displays all arguments of the claim discussion. The remaining argument graphs visualise the ‘evidential’ discussion. Figure 9 visualises the judge’s deciding argument in favour of defendant, while Figure 10 extends it with the judge’s ‘internal dialectic’, i.e., the counterarguments he has himself considered, as well as their refutations. It should be noted that for reasons of space the chart displayed in Figure decisionmainargattack does not repeat arguments against a certain witness as attacks on all statements made by that witness. This made it necessary to combine in this chart the arguments  $A_{18}$  and  $A_{19}$  into a single argument.

All Araucaria charts of this section are available in .jpg and .aml format at <http://people.cs.uu.nl/henry/tent07.html>.

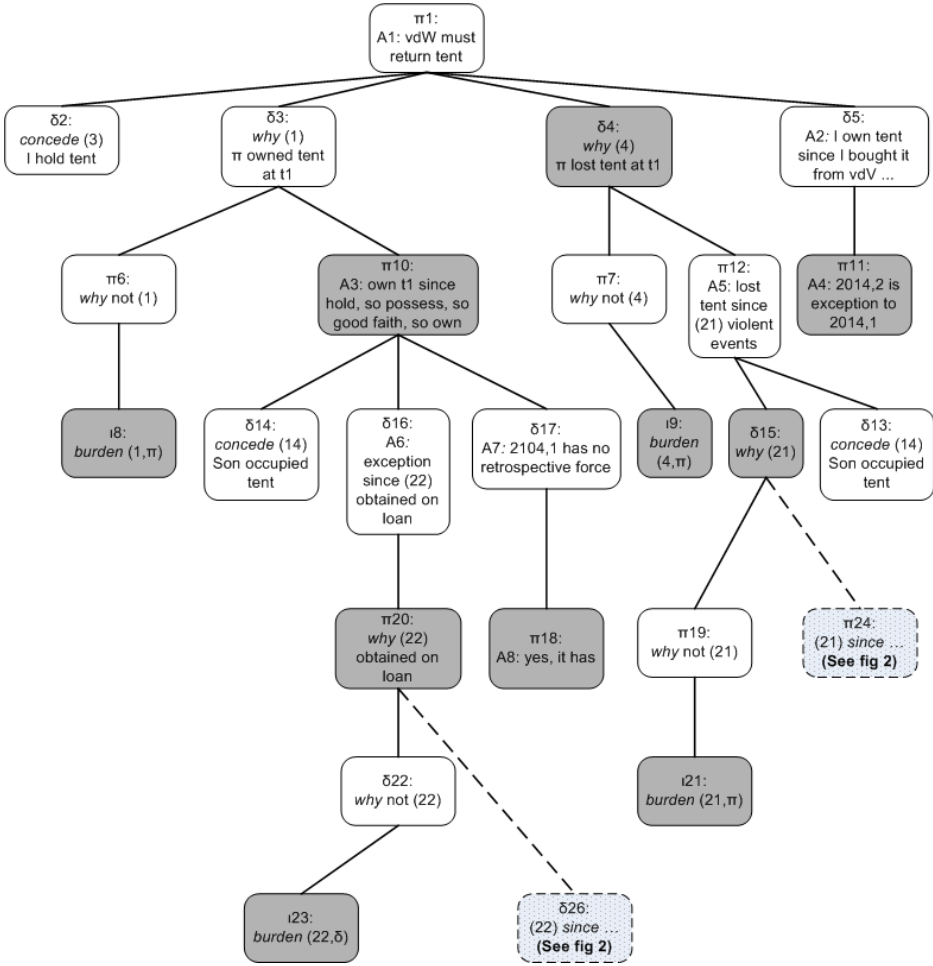


Figure 1: Dialogue after pleadings phase (1): legal issues)

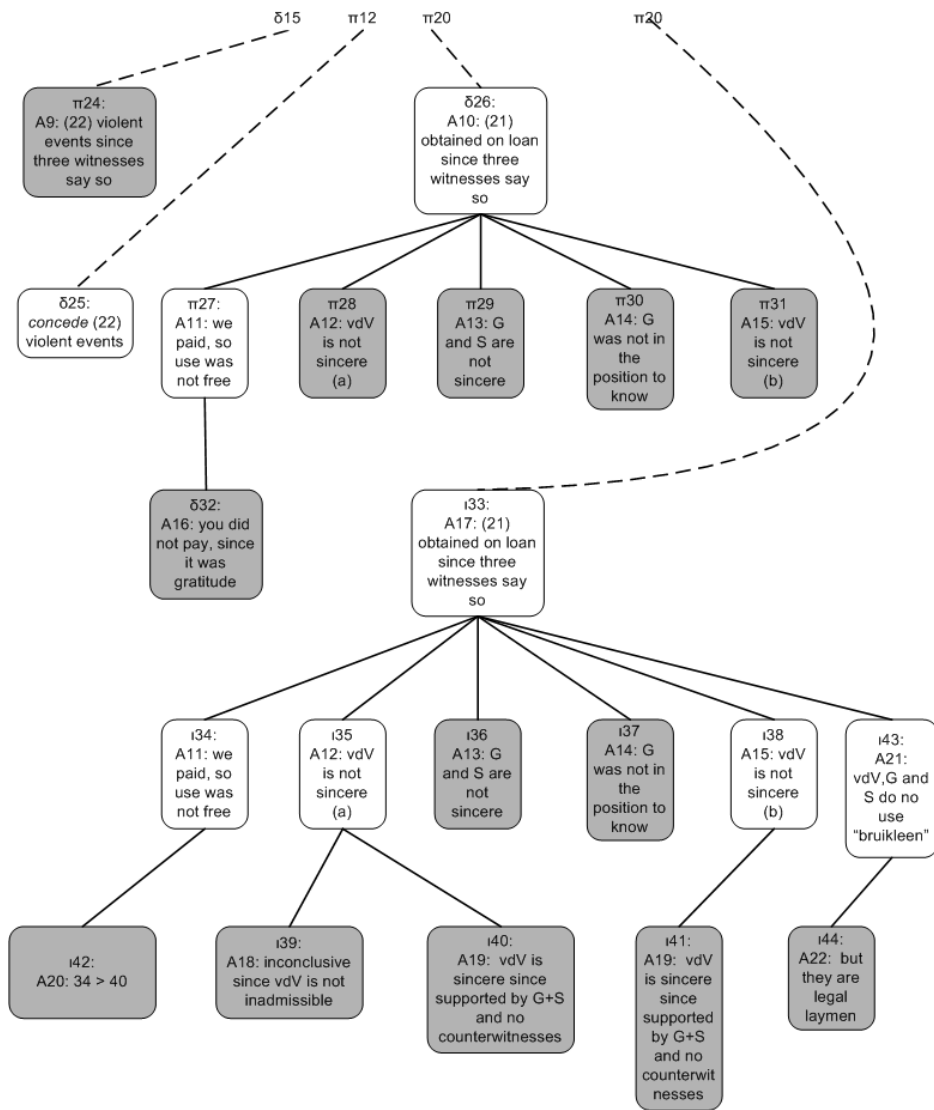


Figure 2: Dialogue after decision phase (evidential issues)

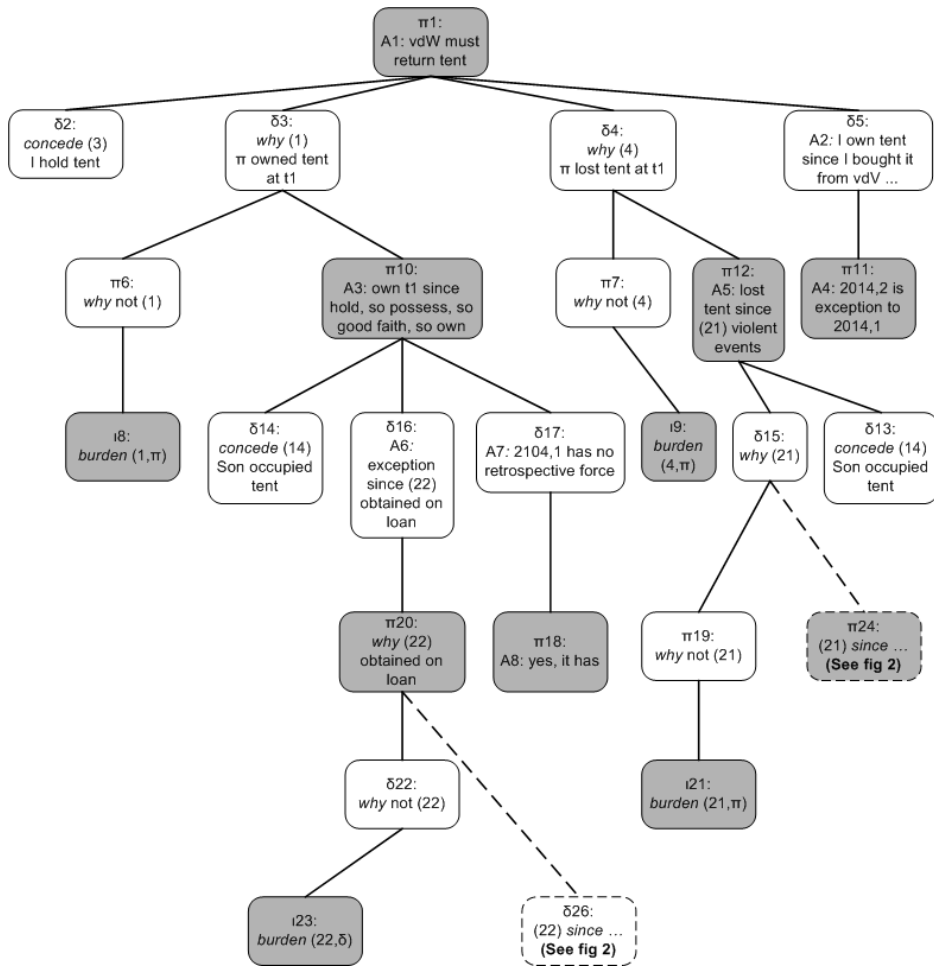


Figure 3: Dialogue after decision phase (legal issues)

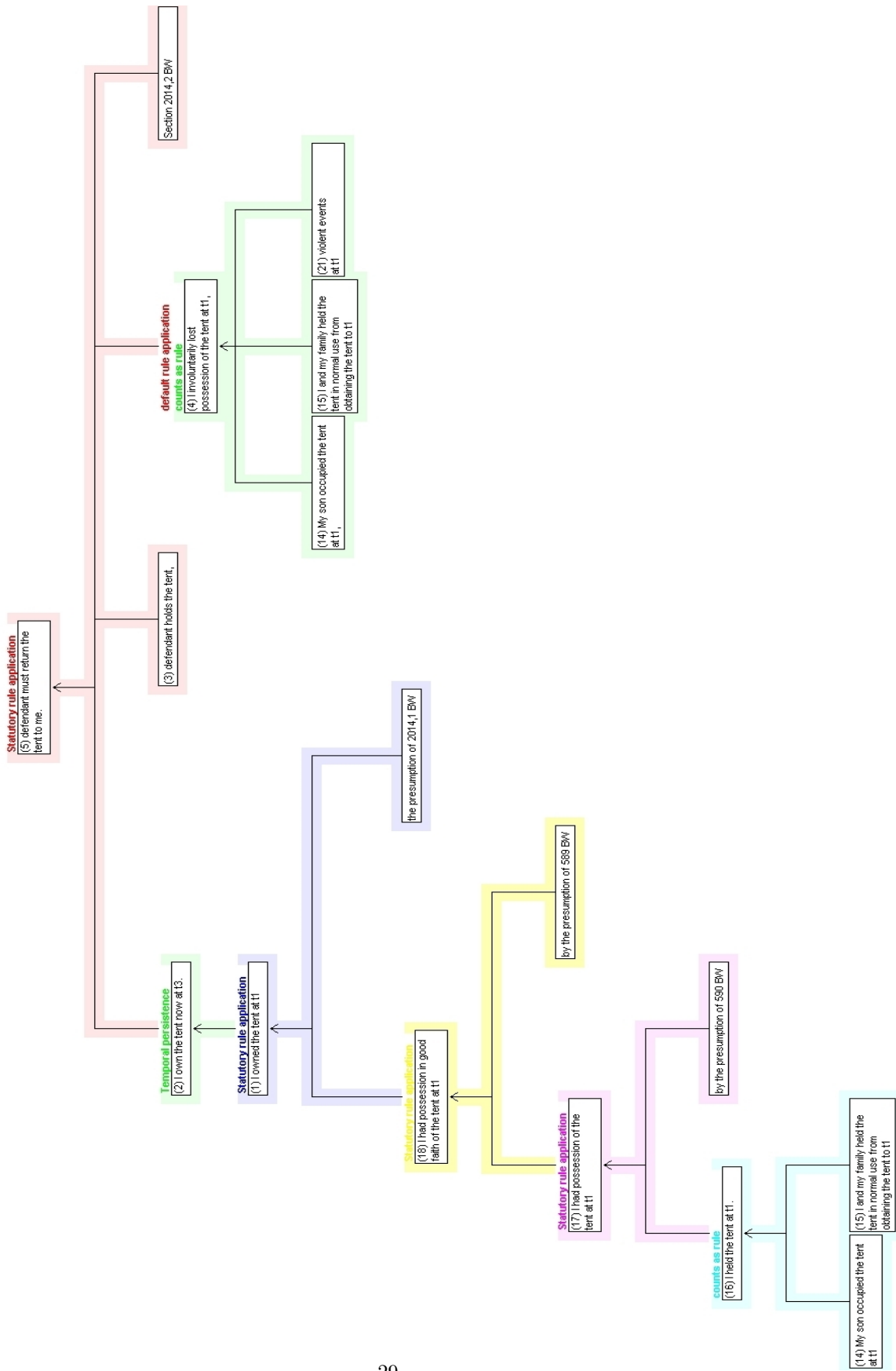


Figure 4: Plaintiff's main argument

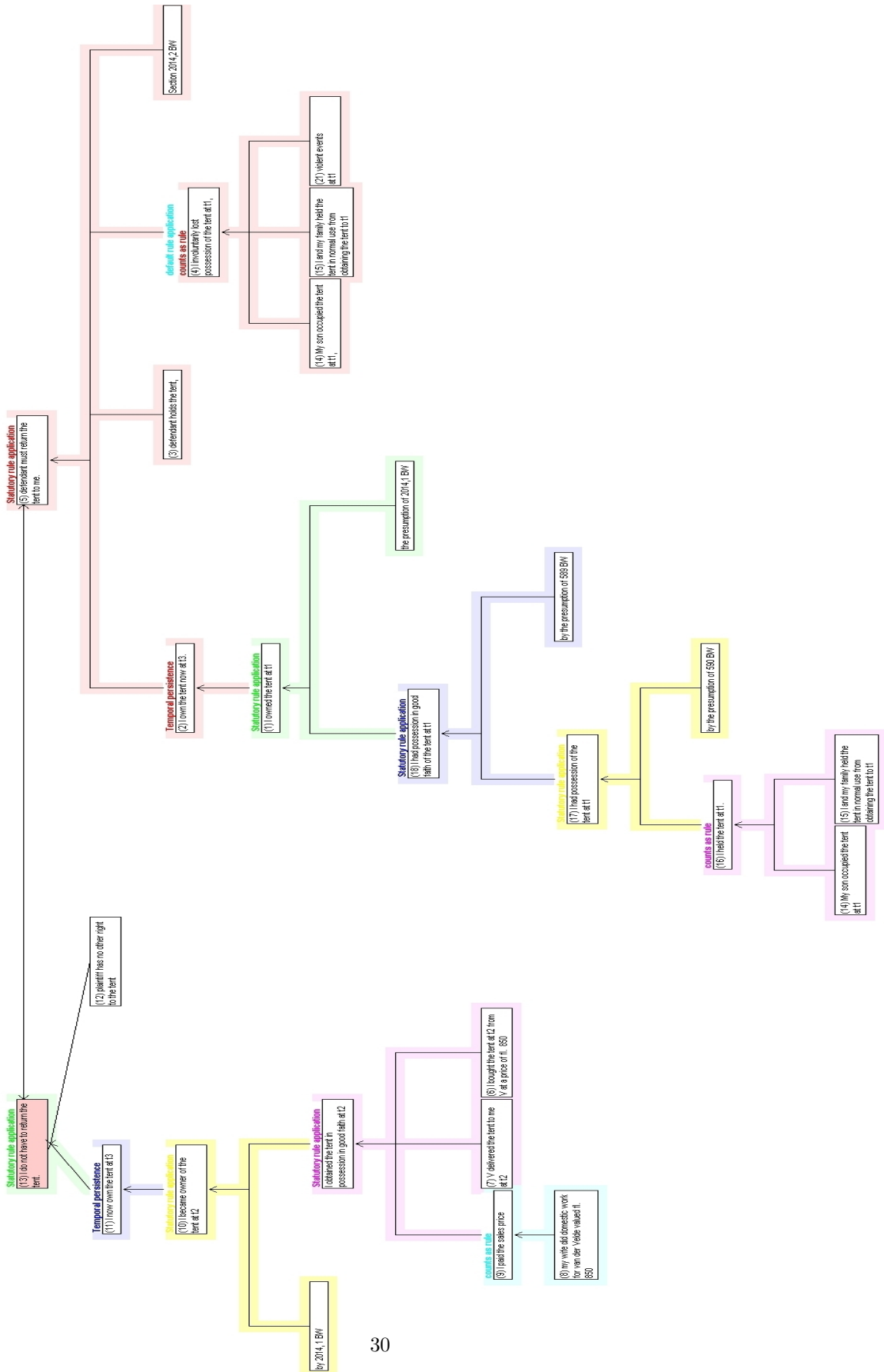


Figure 5: Plaintiff's and defendant's main argument



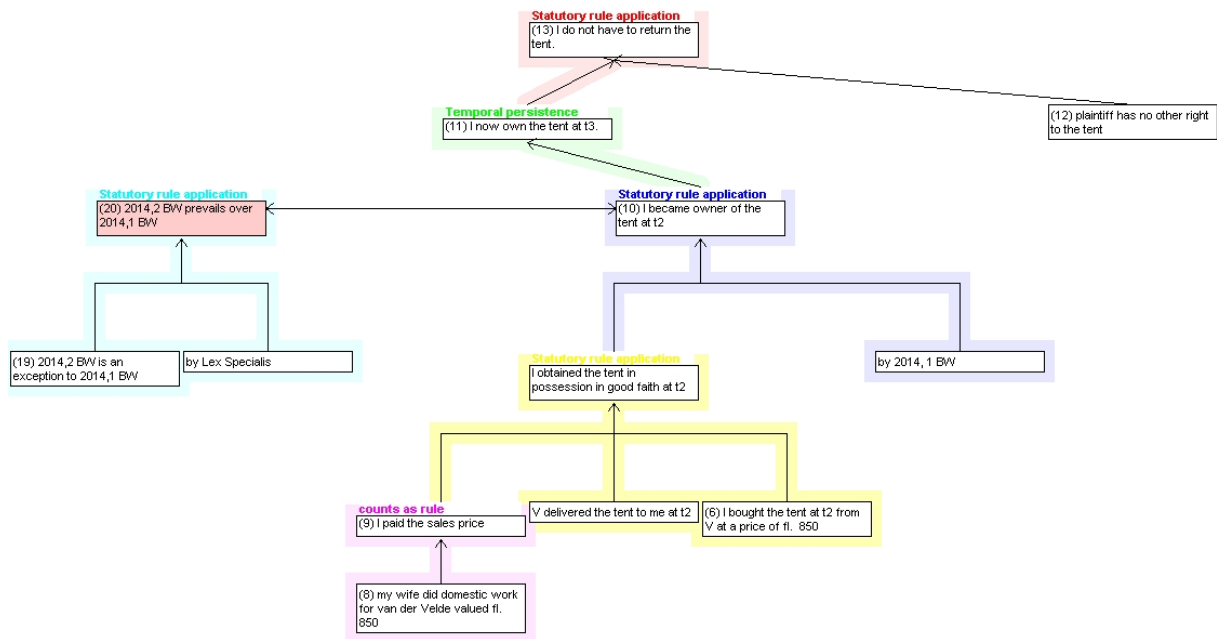


Figure 6: Secondary attack on defendant's main argument

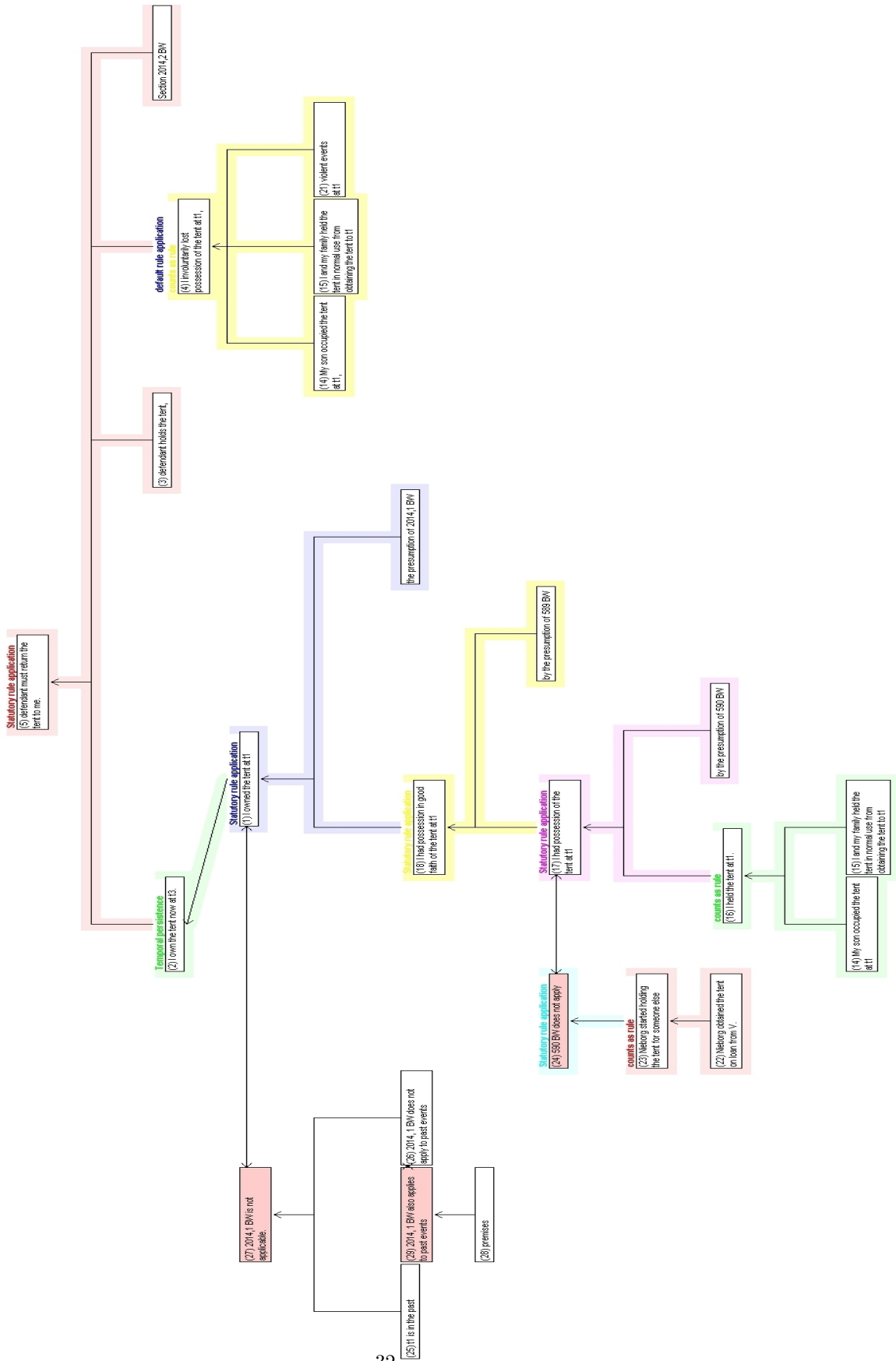


Figure 7: Secondary attacks on plaintiff's main argument

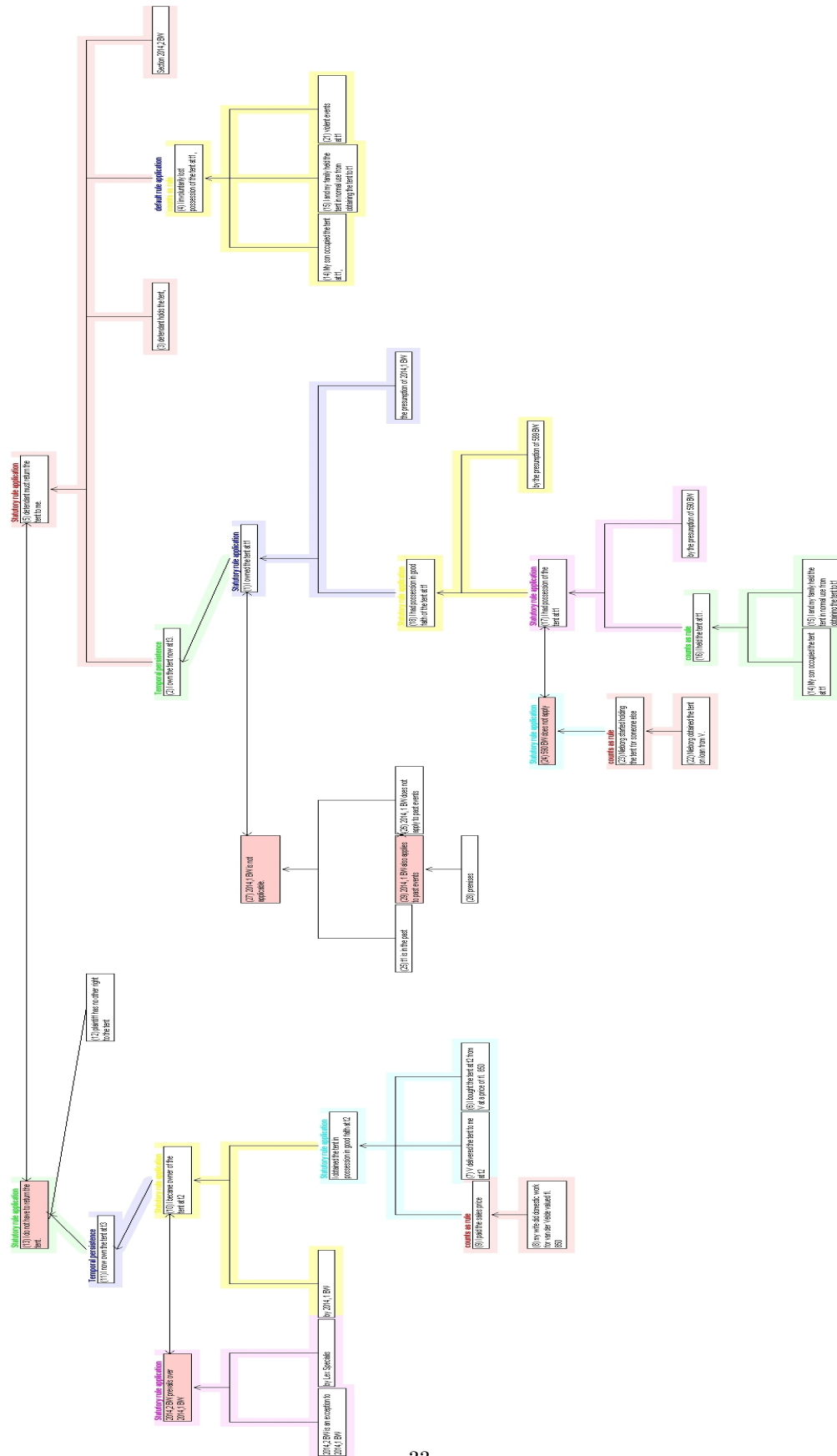


Figure 8: All arguments in the claim phase

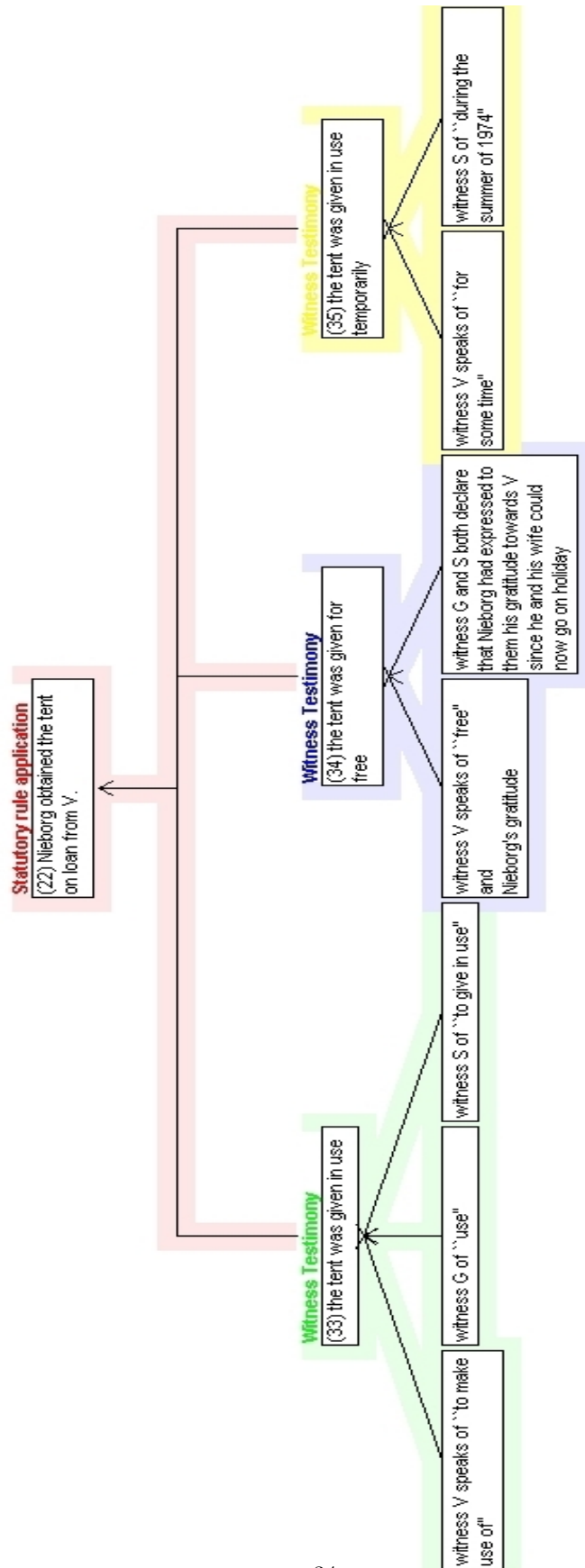


Figure 9: The judge's deciding argument

