Reinterpreting arguments in dialogue: an application to evidential reasoning

Floris Bex[1] & Henry Prakken[1,2]
[1]*Institute of Information and Computing Sciences, Utrecht University, The Netherlands /*
[2]*Faculty of Law, University of Groningen, The Netherlands*

Abstract. This paper presents a formalisation of two typical legal dialogue moves in a formal dialogue game for argumentation. The moves concern two ways of reinterpreting a general rule used in an argument, viz. by 'unpacking' and 'refining' the rule. The moves can be made not only by the user but also by the attacker of the rule, in order to reveal new ways to attack it. The new dialogue game is illustrated with examples from legal evidential reasoning, in which these types of moves are particularly common.

1 Introduction

Generalisations play a key role in reasoning about evidence [17, 18, 16]. Fact finders and triers of fact mostly leave them implicit in their arguments and decisions, but they are necessary to explain why certain evidence supports a certain conclusion. They are also dangerous, however, since their quality is often dubious. Therefore, any model of rational evidential reasoning should allow for the building of arguments with generalisations but also for their critical testing. Such testing both has inferential and dialogical aspects.

As for inference with generalisations, we have argued in [15, 5] that this can be modelled as defeasible argumentation, so that part of the critical testing can be modelled as the construction and comparison of arguments and counterarguments. However, our previous work did not address the dynamic aspects of the critical testing process. As argued by e.g. [18], in evidential reasoning generalisations (which they call "anchors") should be reshaped in a critical inquiry. The aim of this paper, which is based on [4], therefore is to embed defeasible inference with generalisations in a dialogue game where such reshaping can take place.

Dialogue games for argumentation are not new in AI & Law [8, 10, 3, 14]. The present contribution is to add some new dialogue moves that are typical in legal dialogues with unwritten rules, such as commonsense generalisations. From the examples of [18] two patterns emerge in particular: 'unpacking' and 'refining'. Unpacking is when a single generalisation is replaced by a chain of generalisations with the same start and end point as the original one. For instance, [16], the generalisation "if a witness testifies that P is the case then usually P is the case" could be unpacked into "if a witness testifies that he observed P then usually he believes that he observed P", "if a witness believes that he observed P then usually his senses gave evidence of P" and "if a witness' senses gave evidence of P then usually P is the case". Refining is when a generalisation is given an extra condition. For example [18], "two witnesses who agree usually tell the truth" can be argued to have an extra condition that the witnesses did not confer. By making this explicit with "two witnesses who agree and did not confer usually tell the truth", the extra condition becomes open for challenge. Note that refining a generalisation is not the same as arguing for an exception to it. When refining a generalisation of one's opponent, one tries to achieve that the opponent must prove an additional condition before the generalisation can be applied. By arguing for an exception to a generalisation one instead tries to prevent its application by proving that an exception holds.

Unpacking and refining are not matters of inference but of dialogue. They reinterpret an argument moved in a dialogue and thus they crucially differ from current dialogue models, where an argument can only be modified by 'backwards' extending it with an argument for one of its premises. Another difference with current models is that these two moves can be made not only by the user but also by the attacker of the argument, who may thus reveal additional attacking points (for instance, if the attacker has evidence that the witnesses conferred).

In this paper we want to show how these two dialogue moves about generalisations can be added to dialogue models of legal reasoning. A secondary aim is to propose a new way of formulating dialogue games for argumentation, which is arguably better suited for evidential reasoning (as will be explained in Section 3). We do not intend to model an actual legal procedure but a rational theory of how two antagonists can debate the tenability of a claim.

[12] have previously formalised similar reasoning phenomena in the context of reasoning with and about case rationales; see also [2] for informal discussions of relevant examples. We draw inspiration from this work but also add to it, since [12] only focus on how moves like unpacking change the set of arguments of a dispute; they do not embed such moves in a model with other speech acts. Also, of the two moves that we are interested in, they only model 'unpacking' (although they model four other moves about case rationales).

The rest of this paper is organised as follows. In Section 2 we present two informal examples of dialogues with unpacking and refinement moves, after which in Section 3 we discuss some formal preliminaries about logic and dialogue systems. In Section 4 we present our formal dialogue game and we apply it in Section 5 to the example dialogues of Section 2.

2 Motivating examples

In this section we give two example dialogues that involve unpacking and refinement of generalisations, both taken from [18] (the generalisations involved are displayed in boldface). The dialogues are not intended to be complete; other ways of explaining or attacking the generalisations may be possible.

The first example concerns the Rijkbloem case, in which Danny Rijkbloem was prosecuted for shooting the father of his girlfriend, Nicole. The only other possible suspect was Nicole's mother, who was also present at the shooting. However, she was not prosecuted.

prosecution: Rijkbloem shot the father, because mother and daughter testified that Rijkbloem shot the father, and we all know that if two people testify that something is true then it is true. *(making a claim and providing reasons for that claim)*

If witness A testifies that φ and if witness B testifies that φ, then φ is true

defense: Your argument is based on the generalisation "if two people testify that something is true then it is true". This only holds if the two witnesses do not profit from lying.(*exposing a possible "hidden condition" of the generalisation*)

If witness A testifies that φ and if witness B testifies that φ and the witnesses do not profit from lying, then φ is true

defense: What makes you think that the mother and daughter in this case do not profit from lying? *(disputing the newly exposed premise)*

prosecution: I see your problem. Nevertheless, if two witnesses profit from lying but made their statements separately then usually they still speak the truth (because two people rarely

tell exactly the same lie) *(refining the original generalisation in an alternative way).*
If witness A testifies that φ and if witness B testifies that φ and the witnesses profit from lying and the witnesses made their statements separately, then φ is true

The second example concerns the Caroll case, involving an IRA attack on Australian tourists in Roermond, The Netherlands in 1990. A witness had seen a car speeding past with two people in it near the crime. This happened at dusk, so the witness may not have been able to produce a reliable identification of the persons he saw in the car. However, the witness later saw one of the suspects, a mr. Carroll, on the news and in the newspaper. So when the witness was called to testify whether he saw Carroll, he had already seen Carroll in his role as the suspect after the crime and this arguably influenced his positive identification.

prosecution: The witness saw Carroll at the crime, because the witness remembers he saw Carroll at the time of the crime and if a person remembers something then it is true *(making a claim and providing reasons for that claim)*
If witness A remembers that φ, then φ is true

defense: You say that "if a person remembers something then it is true". What you actually mean is that if a witness remembers something, then at the time of the crime the witness believed that it is true, and that if the witness believed something at the time of the crime, then it was true at that time. *(unpacking the original generalisation)*
If witness A remembers that φ, then at the time of the crime the witness believed φ, if at the time of the crime the witness believed φ, then φ is true

defense: In my opinion, your witness did not at the time of the crime believe he saw Carroll. I say this because I heard that the witness did not have a good look at the person near the crime. Furthermore, your witness saw Carroll on TV after the crime, and this may have influenced his memories. (*providing a counterargument to the unpacked generalisation*)

3 Formal preliminaries

3.1 Dialogue games for argumentation

Dialogue games formulate principles for coherent dialogue, and coherence depends on the goal of a dialogue. The goal of argumentation dialogues is fair and effective resolution of a conflict of opinion. Formal dialogue games have a *topic language* L_t with a logic $\mathcal{L}$, and a *communication language* L_c with a *protocol* P. Dialogue games also have *commitment rules,* which specify the effects of an utterance from L_c on the propositional commitments of the dialogue participants. For instance, claiming or conceding φ commits the speaker to φ and a retracting φ removes φ from the speaker's commitments. Commitments can be used to constrain the allowed moves, for example, to disallow moves that make the speaker's commitments inconsistent. They can also be used to define *termination* and *outcome* of a dialogue. In the dialogues we are concerned with here a *proponent* and an *opponent* argue about a single dialogue topic $t \in L_t$. Proponent aims to make opponent concede t while opponent aims to make proponent give up t. So a plausible termination and outcome rule is that a dialogue terminates with a win for proponent if opponent is committed to t, while it terminates with a win for opponent if proponent is not committed to t any more. In addition, for nonterminated dialogues a notion of the *current winner* can be defined to control turntaking and relevance of moves.

In the literature several ways can be found to formulate a protocol for dialogue. Following [11, 8, 3, 6], our idea is that during a dialogue the participants implicitly build a 'theory' to which the logic $\mathcal{L}$ can be applied to determine the current winner. More precisely, $\mathcal{L}$ will be applied to all 'current' premises of either of the participants that are not challenged by the other party. Proponent is then the current winner if the joint theory implies the dialogue topic t while opponent is the winner otherwise. Note that with a player being a current winner we mean no more than that the current state of the dialogue favours that party; the current winner can change many times during a dialogue. The notion is used to control turntaking, with a rule that a player is to move until he has succeeded in becoming the current winner (cf. [11]).

The precise form of our dialogue game is, to our knowledge, new. The idea is that the theory constructed during a dialogue has the form of an inference graph and that the legality of moves and the outcome of dialogues is defined in terms of this graph. The main reason to take this approach is the resemblance of inference graphs to Wigmore charts, which have proven useful in the semiformal analysis of evidential reasoning [1].

3.2 Defeasible inference

Since reasoning about evidence is defeasible, the logic $\mathcal{L}$ of our dialogue system must be a nonmonotonic logic. Following our earlier work in [15, 5] we choose for an argument-based logic, combining some elements from [13] with any suitable notion of skeptical inference. Pollock augments the inference rules of classical logic with a set of defeasible inference rules called 'prima facie reasons'. Arguments can be constructed by chaining reasons into trees, starting from given input information. Each defeasible reason comes with one or more *undercutters*, which specify the circumstances under which the inference is not warranted. Accordingly, a defeasible argument can be defeated in two ways. It can be *rebut* with an argument for the opposite conclusion, while it can be *undercut* with an argument why a prima facie reason does not apply in the given circumstances. To be successful, an attack should be of a certain strength. In the present paper, we will not discuss issues of strength and therefore implicitly assume a given measure of relative strength between arguments.

Since the present focus is on reasoning with empirical generalisations, we will consider just one of Pollock's prima facie reasons, viz. a qualitative version of the *statistical syllogism* (qualitative since in legal cases numerical probabilities are usually not available). Let $\Rightarrow$ be a connective from L_t such that $P \Rightarrow Q$ intuitively reads as"If P then usually Q". The only inference rule that can be applied to formulas of this form is modus ponens. Furthermore, let $P_1, \ldots, P_n \gg Q)$ be shorthand for the metalevel expression "$\{P_1, \ldots, P_n\}$ is a prima facie reason for Q". Finally, let $\lceil \varphi \rceil$ denote the translation of a metalevel expression φ in L_t. Then

$P, P \Rightarrow Q \gg Q$ (*Statistical Syllogism*)

There are two main undercutters for this reason, viz. weak and strong *subproperty defeat*, which say that if for a special case of the antecedent the conditional does not hold (weak) or a conflicting conditional holds (strong), then the original generalisation cannot be used:

weak s.d.: $P \wedge R, \neg(P \wedge R \Rightarrow Q) \gg \neg\lceil P \Rightarrow Q \gg Q \rceil$

strong s.d.: $P \wedge R, P \wedge R \Rightarrow \neg Q \gg \neg\lceil P \Rightarrow Q \gg Q \rceil$

Pollock also defines other reasons relevant for evidential reasoning, such as perception, memory and temporal persistence. Moreover, in [5] we formulated reasons for expert and witness testimonies. In this paper, however, we will regard all these reasons as empirical generalisations, so that they are applied with the statistical syllogism. The reason for this is that inference rules are fixed and cannot be reinterpreted during a dialogue. In [5] we already briefly discussed this issue, and [13] also mentions that his other reasons can be reduced to the statistical syllogism. Finally, we deviate from Pollock's logic in one respect. Pollock requires that all arguments are ultimately grounded in a fixed and undisputable set INPUT of propositions. However, in order to allow for stepwise backwards construction of an argument during a dialogue, we make this set relative to a dialogue stage.

4 The new dialogue game defined

In this section the dialogue game is defined. Because of space limitations the definitions will in some places be semiformal. Below φ is a well-formed formula of L_t and A is an argument of $\mathcal{L}$. Dialogues take place between two players, a proponent *pro* and an opponent *con*. The variable p ranges over the players, so that if p is one player, then $\bar{p}$ denotes the other player. Also, the variable s denotes the speaker of a move. The topic language L_t is that of first-order logic augmented with the defeasible connective introduced above, and the logic $\mathcal{L}$ is the variant of Pollock's system introduced above. As for notation, for any argument A, $prem(A)$ is the set of leaves of A (its premises) and $conc(A)$ is the root of A (its conclusion).

The communication language L_c consists of the following locutions:

- $argue\ A$. The speaker states an argument, either in support of the dialogue topic, or to support a premise of another argument, or by way of counterargument.
- *why* φ. The speaker challenges that a premise φ of an argument is the case and asks for reasons why it would be the case.
- *concede* φ. The speaker admits that a premise or conclusion φ of an argument is the case.
- *retract* φ. The speaker declares that he is not committed (any more) to φ.
- $explain\ (\varphi \Rightarrow \psi = A)$. The speaker reinterprets a generalisation used in an argument "$\varphi, \varphi \Rightarrow \psi$, so ψ". A is an argument in $\mathcal{L}$ without $\varphi \Rightarrow \psi$ such that φ is among the premises of A and ψ is the conclusion of A.

The first four locutions are well-known from the literature, but the *explain* locution is new. It captures unpacking since it allows the argument A to be of arbitrary complexity, as long as ψ is its conclusion and φ is among its premises. It also captures refining, since it allows A to have an additional condition besides φ.

A *dialogue* is now a sequence of utterances of locutions from L_c. Each utterance is called a *move* and a maximal sequence of moves in a dialogue by the same player is a *turn*. The speaker of a move m is denoted by $s(m)$. For any dialogue $d = m_1, \ldots, m_n, \ldots$, the sequence $m_1, \ldots, m_i$ is denoted by d_i, where d_0 denotes the empty dialogue.

4.1 Commitments and disputations

In our setup, dialogue moves have two kinds of effects, viz. on the players' propositional attitudes and on the dialogue's inference graph. As for the propositional attitudes, we keep track both of the players' commitments and their disputations, i.e., the propositions they have disputed. At the start of a dialogue these sets are empty. Since each proposition occurs only once in the inference graph, these sets in fact label the nodes in the graph. Below $C_p(d)$ and $D_p(d)$ stand for the commitments, respectively, disputations of player p after dialogue d.

We first specify the *commitment rules* (only changes will be specified).

- $C_s(d, argue\ A) = C_s(d) \cup prem(A) \cup \{conc(A)\}$
- $C_s(d, concede\ \varphi) = C_s(d) \cup \{\varphi\}$
- $C_s(d, retract\ \varphi) = C_s(d) / \{\varphi\}$

It remains to define how an *explain* move affects the commitments. It is the only speech act that can also commit the hearer.

- $C_s(d, explain\ \varphi = A) = C_s(d)\ \cup\ prem(A)\ \cup\ \{conc(A)\}$ if $\varphi \in C_s(d)$
- $C_{\bar{s}}(d, explain\ \varphi = A) = C_{\bar{s}}(d) \cup prem(A) \cup \{conc(A)\}$ if $\varphi \in C_{\bar{s}}(d)$.

An explanation only commits its mover to the premises and conclusion of the new argument if he was already committed to the original generalisation. This is to allow for explaining the other player's generalisation in order to attack it. Such an attack is impossible if the player automatically commits himself to the explanation, as then he attacks one of his own commitments. Note that the commitment rule for *explain* can commit the hearer to explanations with which he disagrees. This is not a problem, however, since the hearer can always retract his commitment and/or move an alternative explanation (as in the Rijkbloem case).

We must also keep track of the proposition a player has disputed, since arguments with disputed premises will not count in determining the current winner. We define the following *disputation rules* (again only changes are indicated).

- $D_s(d, why\ \varphi) = D_s(d) \cup \{\varphi\}$
- $D_s(d, concede\ \varphi) = D_s(d)/\{\varphi\}$
- $D_s(d, explain\ \varphi = A) = D_s(d) \cup \{\varphi\}$ if $\varphi \notin C_d(s)$

The first two rules are obvious. The third rule says that if a player explains a generalisation to which only his adversary is committed, he disputes the original generalisation φ. The rationale of this rule is that otherwise there would be no point in explaining the generalisation to attack the explanation, as there would still be the original undisputed argument.

4.2 The inference graph of a dialogue

Recall that in our setup the dialogue participants jointly build a theory during a dialogue, to which the logic $\mathcal{L}$ can be applied to identify the 'current winner'. We implement these ideas by formulating the jointly built theory as an inference graph [13] which, as remarked above, has a close correspondence with Wigmore charts. The nodes of an inference graph are propositions and the links are of two kinds. *Support links* instantiate a deductive inference rule or prima facie reason and thus capture inferential dependencies between nodes. If a support link operates on more than one proposition it is in fact an AND-link (depicted below with an arc). *Defeat links* between nodes reflect relations of defeat between the corresponding arguments for the nodes. The set INPUT^d of *current premises* of d is defined as the set of all leaf nodes in the inference graph of d.

Actually, our inference graph differs from Pollock's in one respect. In Pollock's graphs, if a sentence appears in more than one argument, it also appears more than once in the inference graph. In our graph each sentence appears only once, to avoid duplication of sentences. This requires that, unlike in [13], defeat links are labelled with the arguments that are in the defeat relation. Thus there can be more than one defeat link between the same two nodes.

Now the idea is that each move in a dialogue d is regarded as an operation on the inference graph G_d associated with d: arguments add nodes, support links and/or defeat links to the graph, while all moves can affect the commitments and disputations stored as labels of the nodes. Because of space limitations we omit the formal definitions, which should be obvious.

4.3 The current winner of a dialogue and turntaking

To apply a Dung-style inference notion to a graph G_d to define the current winner of dialogue d, we define the set $Args_{G_d}$ of *arguments in* G_d. Recall that arguments are trees of inferences, so this is the set of all maximal subgraphs of G_d in which no node has more than one incoming support link. The set *DefArgs*$_{G_d}$ of all *defended arguments in* G_d is the set of all arguments in *Args*$_{G_d}$ of which all premises (= leaf nodes) are in the commitments of at least one player and in the disputations of neither player. Thus the defended arguments are all arguments with no disputed or retracted premises. As proven in [9], Pollock-style defeat can be equivalently transformed to Dung-style defeat, so that *DefArgs*$_{G_d}$ corresponds to a Dung-style argumentation framework AF_d to which any of [7]'s dialectical inference notions can be applied. To make sense in the present context, it must be a skeptical inference notion (in our examples below the choice does not matter). We then say that proponent *currently wins* a dialogue d if the dialogue topic t is skeptically implied (according to the chosen inference notion) by AF_d and that opponent *currently wins* d otherwise. Note that the protocol implements a 'burden of questioning' principle [19], as the current winner of a dialogue is calculated on the basis of all commitments of one party that are not challenged by the other party.

With the notion of a current winner, a turntaking rule can be defined as follows: T is a function that for each dialogue returns the players-to-move, such that $T(d_0) = pro$ and else $T(d) = \bar{p}$ iff p currently wins d. Thus the 'resources' are always allocated to the losing side, which according to [11] promotes a fair and effective inquiry.

4.4 The protocol

The protocol P specifies the allowed moves at each stage of a dialogue. Its formal definition is as follows. Together the conditions below imply that each dialogue starts with an argument by proponent; its conclusion is the topic t of the dialogue.

For all moves m and dialogues d it holds that $m \in P(d)$ if and only if all of the following conditions are satisfied:

1 $T(d) = s(m)$
2 m was not already moved in d by the same player
3 $C_s(d, m) \nvdash \bot$
4 $C_s(d, m) \cup D_s(d, m) = \emptyset$
5 If M is an *argue* A move (where φ is A's conclusion), then extending G_d with A adds at least one node or link to G_d, and
  - either $d = d_0$
  - or $\varphi \in G_d$ and $\varphi \in D_d(\bar{s})$
  - or φ defeats a node in G_d.

6 If m is a *why* φ move, then
  - $\varphi \in$ INPUT^d
  - $\varphi \notin D_s(d)$
  - $C_s(d) \nvdash \varphi$

7 If m is a *concede* φ move, then $\varphi \in G_d$ and $\varphi \notin C_s(d)$
8 If m is a *retract* φ move, then $\varphi \in C_s(d)$
9 If m is an *explain* $(\varphi = A)$ move, then $\varphi \in G_d$ and extending G_d with argument A adds at least one node or link to the graph
10 $t \in C_{pro}(d)$ and $t \notin C_{con}(d)$.

The first two conditions say that only the player-to-move can make allowed moves and that a player may not repeat his moves. Conditions (3) and (4) regulate the players' logical and dialogical consistency. Conditions (5)-(9) specify specific conditions for each speech act type. Condition (5) ensures that an *argue* move is only moved if it is the initial move, or if it provides a reason for a disputed proposition, or if it attacks another argument in the graph.

Also, the argument moved has to extend the graph, so that arguments that are already in the graph cannot be repeated. Condition (6) says that a proposition φ can be challenged only if φ is a leaf node in the inference graph, is not already disputed by the speaker and does not classically follow from the speaker's commitments. Condition (7) ensures that a player concedes a proposition only if it is in the graph and the player is not already committed to it. Condition (8) says that a player can only retract a proposition to which he is committed. Condition (9) ensures that only generalisations that are already in the graph can be explained and that an explanation extends the graph. Finally, condition (10) regulates termination of dialogues. It implies that a dialogue terminates if either the proponent is no longer committed to the dialogue topic or the opponent has conceded it: then no further move is allowed.

The protocol ensures relevance of moves as follows. To start with, only propositions that were moved as premise of an argument can be challenged, conceded or retracted. Furthermore, a new argument must either be a counterargument to an argument in the inference graph or a support for a challenged node in the graph, so players cannot just move any argument. Finally, players cannot repeat their moves.

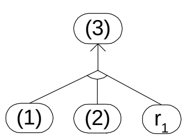
5 The examples formalised

We now formalise the examples of Section 2 in our dialogue system. In displaying inference graphs, parts involving retracted nodes will not be shown and undefended arguments will be depicted with dotted lines. The sets $C_i(p)$ and $D_i(p)$ stand for player p's commitments, respectively, disputations after dialogue d_i.

5.1 The Rijkbloem case

The prosecution, who is the proponent in this example, claims that Rijkbloem shot the father (the dialogue topic) and brings forward the mother's and the daughter's witness testimonies.

- pro_1:
$argue$ (1): mother's testimony that Rijkbloem shot the father,
(2): daughter's testimony that Rijkbloem shot the father,
r_1: (witness A testifies that φ) $\wedge$ (witness B testifies that φ) $\Rightarrow \varphi$,
so (3): Rijkbloem shot the father



pro_1: the initial argument is moved

$C_1(pro) = \{(1), (2), r_1, (3)\}$
$C_1(con) = \{\}$
$D_1(pro) = \{\}$
$D_1(con) = \{\}$

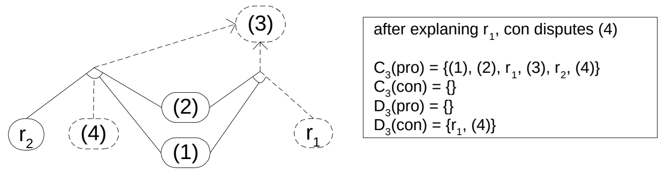
The only argument in G_{d_1} concludes to the dialogue topic, so the turn shifts to *con*, who now first adds a hidden condition to r_1 and then disputes it.

- con_2:
$explain$ r_1 =
(1): mother's testimony that Rijkbloem shot the father,
(2): daughter's testimony that Rijkbloem shot the father,
(4): mother and daughter do not profit from lying,
r_2: (witness A testifies that $\varphi \wedge$ witness B testifies that $\varphi \wedge$ the witnesses do not profit from lying) $\Rightarrow \varphi$
so (3): Rijkbloem shot the father

The generalisation r_1 is now disputed. Note that if a player provides an explanation, the original generalisation remains in the graph, to allow for alternative explanations of the same generalisation (as *pro* is about to give). Also note that through moving the above explanation, con has committed pro to the premises and conclusion of the new argument.

Next, con makes a why move, disputing the new premise:

- con_3: why mother and daughter do not profit from lying

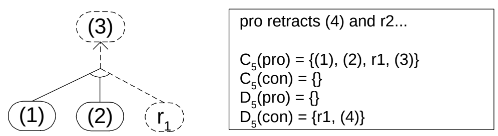


The graph now contains two arguments for the dialogue topic. Although they have no counter-arguments, both have a disputed premise, so *con* is the current winner and the turn shifts back to *pro* (note that before *con*$_3$ the argument with (4) was defended, so *pro* was still winning).

pro disagrees with con's way to explain r_1 and now explains r_1 in an alternative way by saying that even if the witnesses profit from lying, if they make their statements separately, then they still usually speak the truth. To make this move, pro first has to retract (4) and r$_2$.

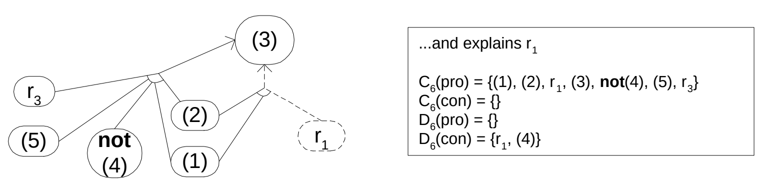
- pro_4: $retract$ (4): the witnesses profit from lying

- pro_5: $retract$ r$_1$: (witness A testifies that $\varphi \wedge$ witness B testifies that $\varphi \wedge$ the witnesses do not profit from lying) $\Rightarrow \varphi$



By retracting these propositions, pro indicates that he does not accept *con*'s explanation of his original generalisation r$_1$. pro must now provide a new argument for (3), as his original argument using r$_1$ is still disputed. pro moves an alternative explanation to r$_1$:

- pro_6:
$explain$ r$_1$ =
(1): mother's testimony that Rijkbloem shot the father,
(2): daughter's testimony that Rijkbloem shot the father,
¬(4): mother and daughter profit from lying,
(6): mother and daughter made their statements separately,
r$_3$: (witness A testifies that $\varphi \wedge$ witness B testifies that $\varphi \wedge$ the witnesses profit from lying $\wedge$ the witnesses made their statements separately) $\Rightarrow \varphi$
so (3): Rijkbloem shot the father

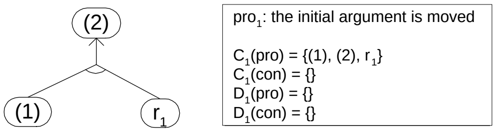


By incorporating $\neg(4)$ as a premise, pro effectively concedes that mother and daughter had reason to lie. Nevertheless, the graph now again contains a defended argument for the dialogue topic and since it has no counterarguments, *pro* is the current winner.

5.2 The Carroll case

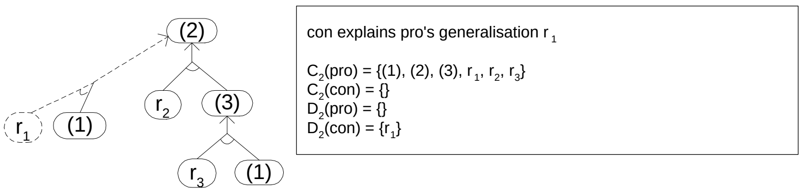
The prosecution, who argues for the fact that Carroll was one of the two men in the car, gives a simple argument for the fact that Carroll was near the crime.

- pro_1:
$argue$ (1): the witness remembers he saw Carroll at the time of the crime,
r$_1$: a witness remembers $\varphi \Rightarrow \varphi$,
so (2): the witness saw Carroll



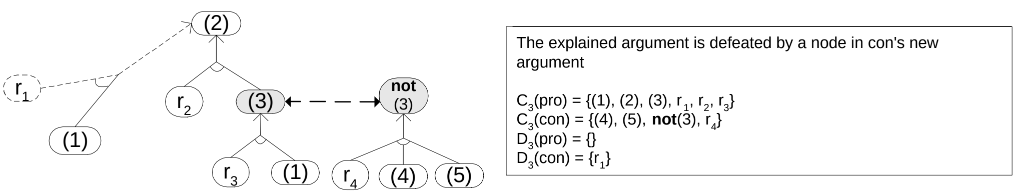
The opponent now reveals a new attacking point by by explaining r_1.

- con_2:
$explain$ r_1 =
(1): the witness remembers he saw Carroll at the time of the crime,
r_2: a witness remembers $\varphi \Rightarrow$ at the time of the crime the witness believed φ,
so (3): at the time of the crime the witness believed that he saw Carroll,
r_3: at the time of the crime the witness believed $\varphi \Rightarrow \varphi$
so (2): the witness saw Carroll



Although *pro* is still winning, *con* can now move a counterargument.

- con_3:
$argue$ (4): the witness did not have a good look at the person near the crime,
(5): the witness saw Carroll as a suspect on the news after the crime,
r_4: (a witness did not have a good look at person P_1 during the crime
$\wedge$ witness saw person P_2 as a suspect after the crime)
$\Rightarrow$ at the time of the crime the witness did not believe that he saw person P_2
so $\neg$(3): at the time of the crime the witness did not believe that he saw Carroll



The arguments for (3) and $\neg$(3) are both defended. Supposing they are equally strong, they defeat each other (indicated by the grey shadings) so that the dialogue topic is not skeptically implied by AF_{d_3}. So *con* is the current winner and the turn shifts back to *pro*.

6 Conclusion

In this paper we have shown how two typical moves in legal dialogues can be regulated in a formal dialogue game. Both moves reinterpret rather than extend an argument moved in a dialogue. Such reinterpreting moves have so far received little attention in AI & Law research. For the theory of evidential reasoning we have aimed to provide a better understanding of two aspects of the critical testing of evidential arguments. For AI & Law models of legal dialogue we have provided a possible formalisation of two types of dialogue moves that are important in legal reasoning. The relevance of our contributions is not confined to evidential reasoning since, as shown by [12] and [2], these moves also occur about other types of unwritten rules, such as precedent rationales.

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