Formalizing Practical Argumentation
Lecture 3:
Logics for Defeasible Argumentation II. Dialectical proof theory

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Introduction

- General idea:

  - A proof takes the form of a dialogue;

  - An argument is 'in' iff the proponent can make the opponent run out of moves against every possible attack.

- Relevant research:

  - Epistemology (Rescher)

  - Dialogue logic (Hintikka, Lorenzen, Lorenz, Barth & Krabbe)

  - Formal dialectics (Hamblin, Mackenzie, Walton & Krabbe)

  - AI (Simari & Loui, Loui, Vreeswijk, Dung, Prakken & Sartor)

Assuming the evidence concerning the glove

was not forged, it proves guilt of OJ.

I know that the evidence concerning the glove was forged,

since I was told so, so your assumption is not warranted.

The evidence concerning the glove was not forged,

since it was found by a police officer,

and as a general rule police officers don't forge evidence.

Proof theory for grounded semantics

Definition 0.1 *A* dialogue *is a sequence of moves of a proponent P and an opponent O such that*

1. *Each move is an argument;*

2. *P begins and then O en P take turns;*

3. *P does not repeat moves;*

4. *O's moves defeat P's preceding move;*

5. *P's moves strictly defeat O's preceding move.*

Definition 0.2 .

- *A player wins a dialogue iff the other player cannot move.*

- *An argument A is provably justified iff P has a winning strategy in a dialogue beginning with A.*

Results:

- Soundness in the general case

- Completeness in the finitary case, i.e. when each argument has at most a finite number of defeaters.

Proof theory for defeasible priorities

- Recall:

  - Language must contain a special predicate symbol $\prec$;

  - defeat is relative to the priority conclusions of sets of arguments (S-defeat).

- Problem: which priorities should be considered in determining defeat?

- Solution:

  - For P's moves: only those stated by P;

  - For O's moves: none.

- Restriction: $Args$-defeat must decrease if $Args$ increases

types of priority moves

r_1: $p \Rightarrow q$

r_2: $r \Rightarrow s$, r_3: $s \Rightarrow \neg q$

r_4: $t \Rightarrow \neg s$, $r_5 : r_2 \prec r_4$

r_1: $Monument(h) \Rightarrow \neg Modifiable(h)$

r_2: $Needs\_restructuring(h) \Rightarrow Modifiable(x)$

r_3: $Town\_planning\_rule(r_2) \wedge Protection\_rule(r_1) \Rightarrow r_2 \prec r_1$

T: $Later(r_2, r_1) \Rightarrow r_1 \prec r_2$

S: $More\_specific(r_3, T) \Rightarrow T \prec r_3$

Definition 0.3 *A* priority dialogue *is a sequence of moves of a proponent P and an opponent O such that*

1. *Each move is an argument;*

2. *P begins and then O en P take turns;*

3. *P does not repeat moves;*

4. *O's moves $\emptyset$-defeat P's preceding move;*

5. *P's moves (called P_i)*

   (a) *either strictly P_i-defeat O's preceding move;*

   (b) *or makes P_{i-1} strictly P_i-defeat O_{i-1}.*

The results still hold.

Research questions:

- How do changes in semantics and proof
  theory relate?

  - For *defensible* arguments: reverse burden
    of proof! And

  - For *preferred/stable* semantics: For each
    player its set of moves in a dialogue must
    be conflict-free (?)

- Extend to multi-agent decision-making and
  negotiation

- Relation with 'formal dialectics'
  (argumentation theory)