Formalizing Practical Argumentation
Lecture 8:
A Model of Negotiation as Argumentation

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Contents

1 Introduction

- Negotiation: any process of reaching agreement on certain courses of action
- Negotiation vs. group decision making: a gradual difference
  - Both involve argumentation: attempting to change someone's beliefs and preferences
- Parson, Sierra & Jennings: negotiation *as* argumentation:
  - *Generating* proposals: argumentation *within* agent
  - *Evaluating* proposals: argumentation *between* agents

2 PSJ's negotiation protocol

- Speech acts:
  - Proposals
  - Critiques (incl. acceptance and rejection)
  - Counterproposals

  Any can be combined with *meta information*, e.g. arguments

  PSJ's belief: including meta information makes agreement more likely
- Protocol: see state transition diagram

3 Design of negotiating agents

- Agents have goals (and beliefs, desires ...)
- If goal cannot be obtained individually, enter negotiation
- proposals generated by internal argumentation
- different agents can have
  - different beliefs, desires, goals
  - different logics
  - different policies for adopting beliefs etc
- No assumptions of:
  - complete knowledge
  - cooperativeness

4 The argumentation system

(extending Krause et al.)

- Arguments: deductions, with (deductive) inference rules made explicit
- Rebutting an argument: when contradictory conclusions (roughly)
- Undercutting an argument: when rebutting a subargument
- Idea: formalize attack on inference rule (generalizing Pollock's undercutters)
- Ordering on arguments:
  - A1: all arguments
  - A2: all consistent arguments
  - A3: all arguments without rebutters
  - A4: all arguments without undercutters
  - A5: All arguments for logical validities

5 Argumentation as negotiation

1. N selects intention to be satisfied
2. If cooperation needed, N builds an argument for proposal, sends it to M
3. Upon receipt:
   (a) If M finds no counterargument: accepts proposal
   (b) If M finds counterargument: sends it to N
4. N generates alternative proposal (when N_1 is undercut), or N attacks M's counterproposal
5. ...

NB: Arguments are evaluated *within* agents

Example

N_1:
- I want to hang a picture, I have a hammer but no nail, so give me your hammer
- $N : N_1 = A4$

M_1:
- $N : N_1 = A4$
- I want to hang a mirror, so I need my nail, so I cannot give it to you
- $M : M_1 = A4, N_1 = A2$

N_2:
- $N : M_1 = A4, N_1 = A2$
- You have a screwdriver, I have a screw, if I give you the screw, you don't need your nail.
$N : N_2 = A4, M_1 = A2, N_1 = A4$

NB: reinstatement of N_1 is not captured by the formalism.

Conclusions

PSJ's proposal is very interesting, but:

- They need argumentation logic with reinstatement
- They might need notion of actual dialogue
- They might need features of the Pleadings Game (conceding, denying, ...)

Epilogue

Important in future AI research on argumentation:

- Move from single agents to multi agents:
  - Protocol
  - Dynamic construction of theories