



Social and Persuasive Argumentation over Organized Actions

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Maxime Morge
Università di Pisa

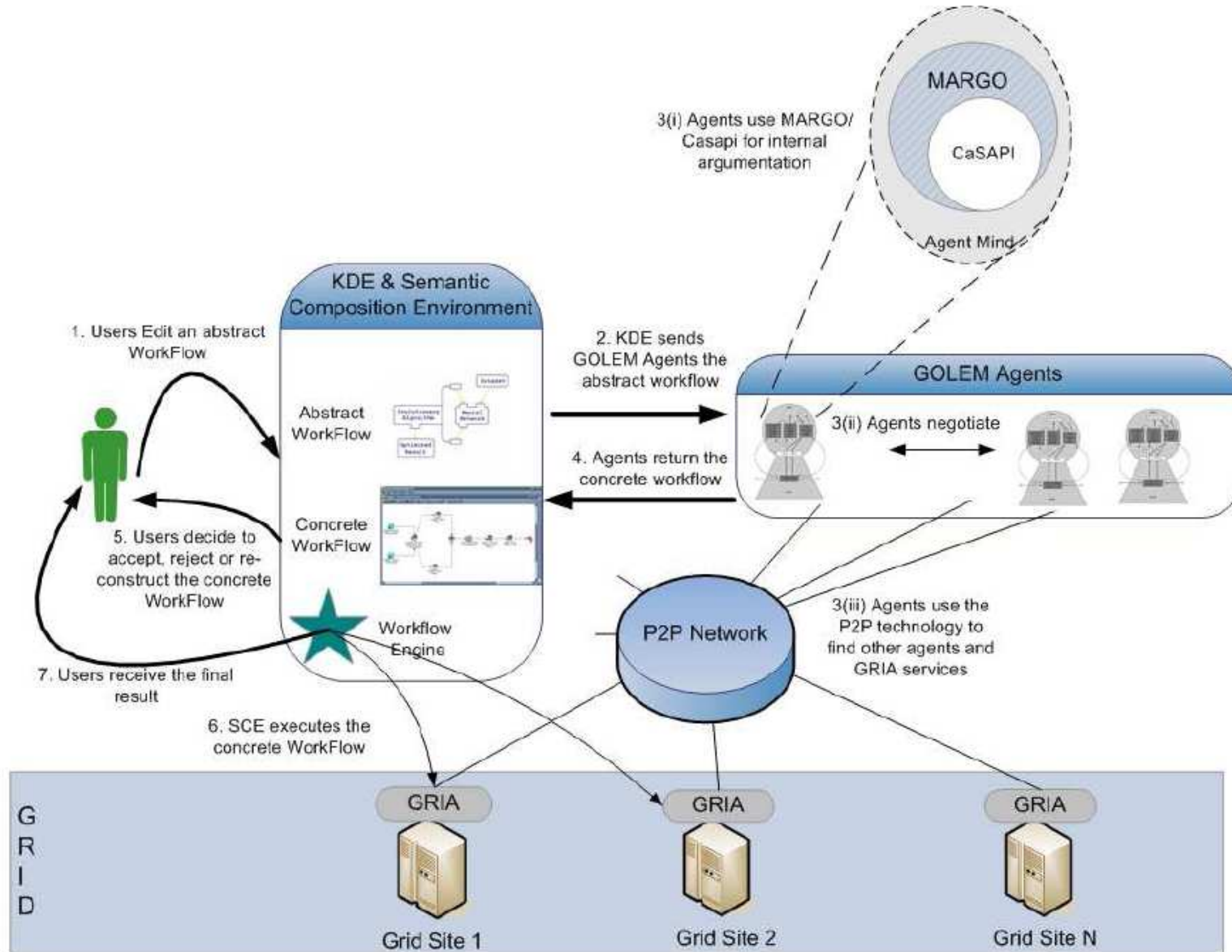
ARGUmentation as a foundation for the semantic GRID



- Provide a new model for argumentative agents populating and evolving within a trusted grid.
- Provide a new model for the specification, creation, operation and dissolution of **Virtual Organizations** over the grid using argumentation.
- Design an architecture for the semantic grid to support argumentative agents and VOs.
- Develop a grid-based platform to support the implementation of models and architecture and assess the approach.
- Experiment with and evaluate the models, architecture and platform in the context of concrete applications for e-business.



Global Picture of the ARGUGRID platform



Motivation



- How to persuade a partner to make a deal ?
- The Sociology of Organized Actions [Crozier 77]= background for analysing the organizational dimension of MAS.
- Concrete Action Systems (CAS) [Sibertin 06]: Formalize agents, resources, motivations and social power/relationship.
- Apply our argumentation technology [Morge ARGMAS 07].
- Provide persuasive dialogues.



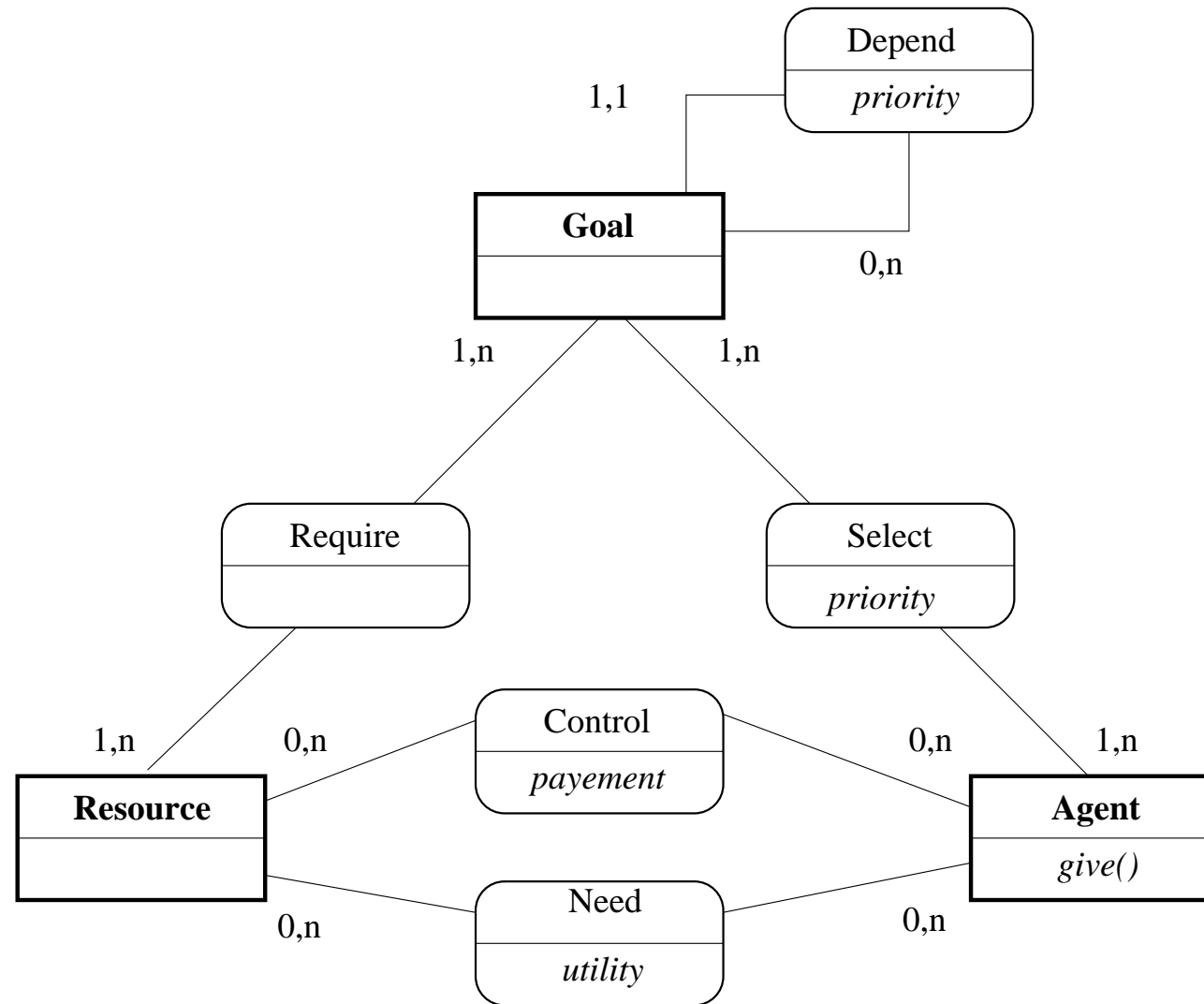
Plan



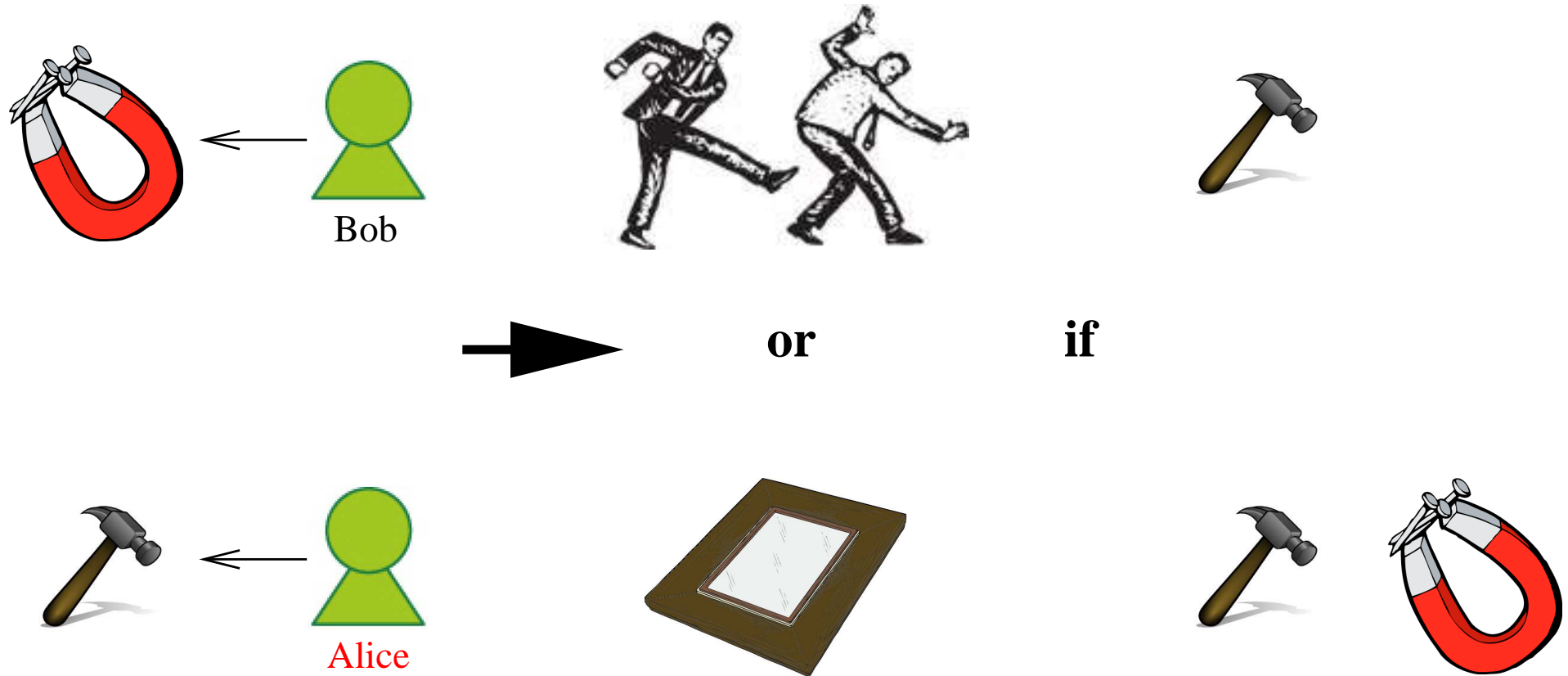
- ARGUGRID
- Formal Concrete Action Systems
- Argumentation-based mechanism for decision making
 - Decision analysis
 - Decision framework
 - Arguments
- Social interaction
- Conclusions



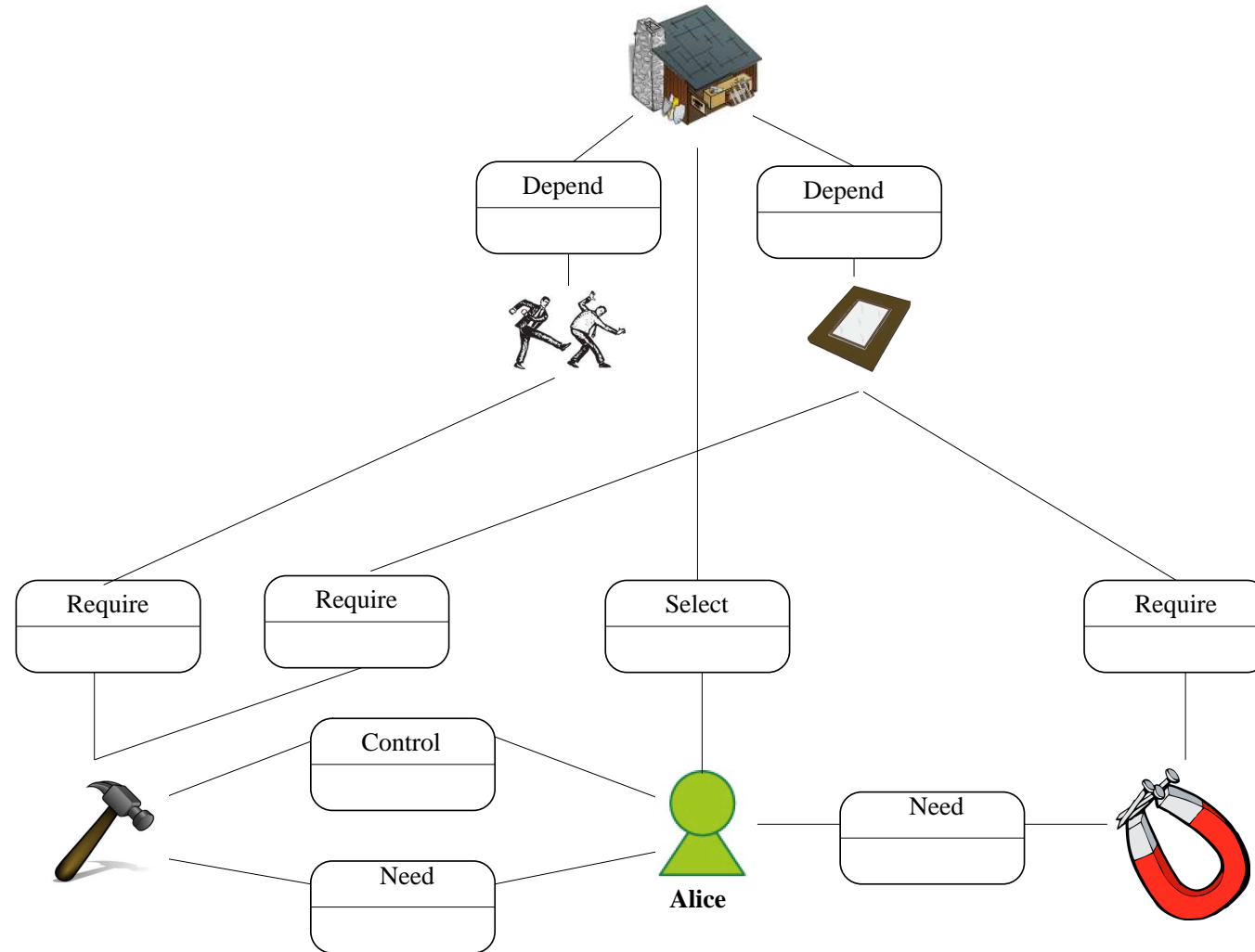
Concrete Action Systems (CAS) [Sibertin 06].



The "hang a picture" example [Sierra ATAL 97]



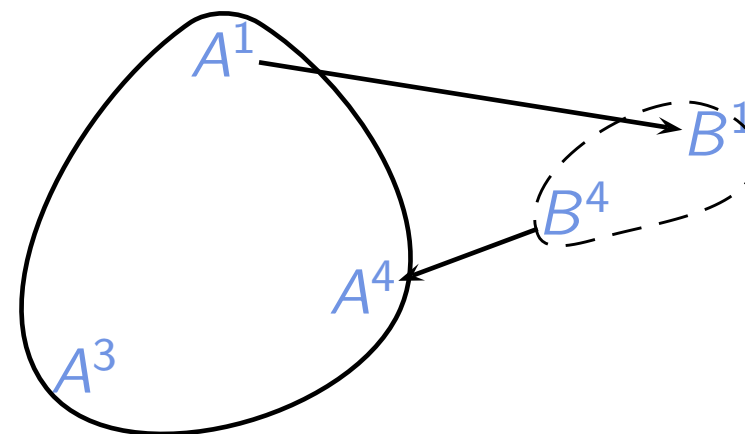
CAS for the "hang a picture" example



Arguments as reasons supporting claims which can be disputed by other reasons.



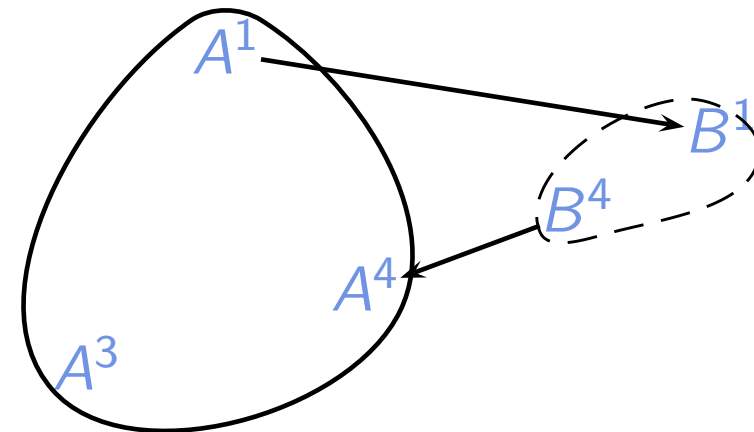
- 1 Who give his resource ?
- 2 Bob give the nail.
- 3 Why ?
- 4 hung because of hang(alice).
- 5 Why not hang(bob) ?
- 6 hung because of hit(alice).



Arguments as reasons supporting claims which can be disputed by other reasons.



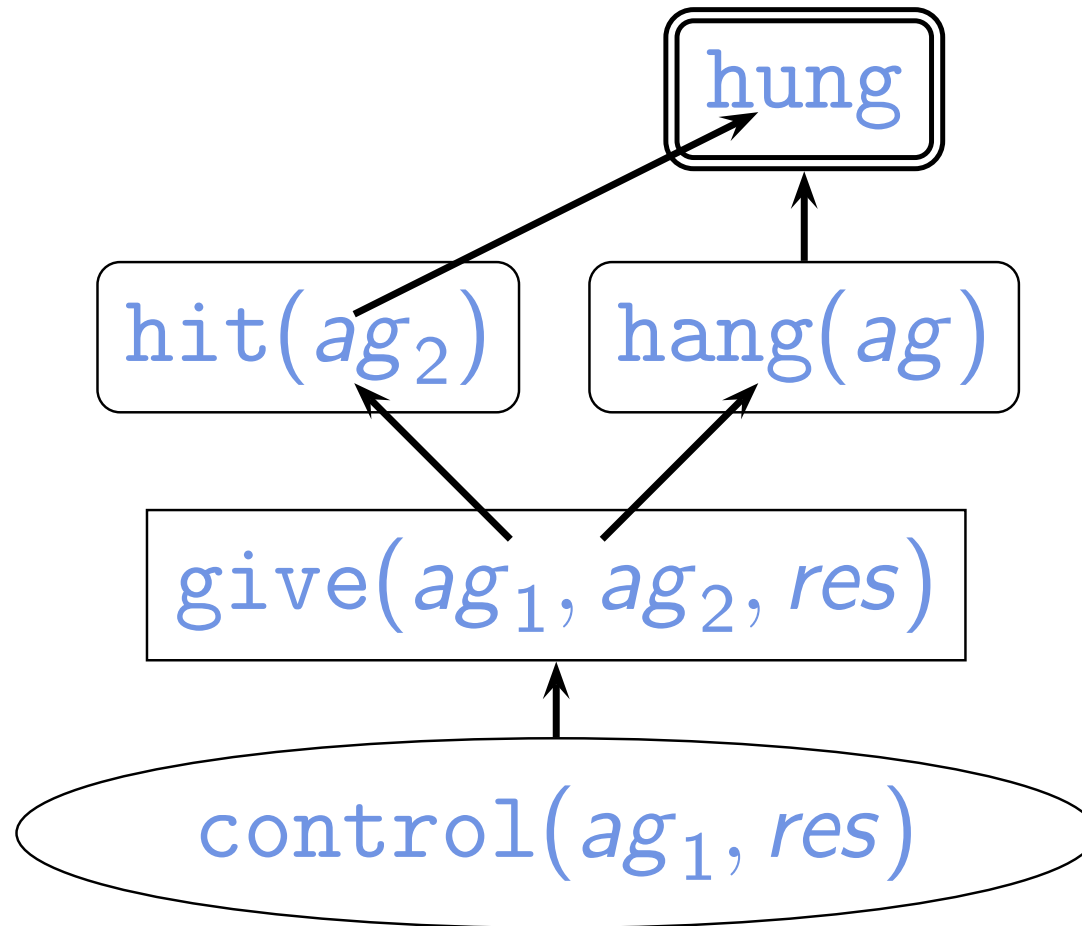
- ① Who give his resource ?
- ② Bob give the nail.
- ③ Why ?
- ④ hung because of hang(alice).
- ⑤ Why not hang(bob) ?
- ⑥ hung because of hit(alice).



In [Morge ARGMAS 07]:

- Argumentation framework and semantics by admissibility.
- Decisions are taken if supported by admissible arguments.
- Need for extensions (handle user's representation/preferences).
- Implemented by MARGO (<http://margo.sourceforge.net>).

Social persuasion: an example of multi-criteria decision making with incomplete knowledge



Knowledge, Goals, Decisions, and Priority



A decision framework is a tuple $\mathcal{D} = \langle \mathcal{L}, \mathcal{A}sm, \mathcal{I}, \mathcal{T}, \mathcal{P} \rangle$, where:

- \mathcal{L} is the **object language** which captures the statements about the decision problem;
- $\mathcal{A}sm$, is a set of sentences in \mathcal{L} which are taken for granted, called **assumptions**;
- \mathcal{I} is the **incompatibility relation**, i.e. a binary relation over atomic formulas which is asymmetric. It captures the mutual exclusion between the statements;
- \mathcal{T} is the **theory** which gathers the statements;
- $\mathcal{P} \subseteq \mathcal{T} \times \mathcal{T}$ is a (partial or total) preorder over \mathcal{T} , called the **priority relation**, which captures the uncertainty of beliefs, the priority amongst goals, and the expected utilities of the decisions.

Goal rules, decision rules, and epistemic rules



$$\frac{\mathcal{T}}{\begin{array}{l} \uparrow \\ r_{01}: \text{hung} \leftarrow \text{hang}(me), \neg\text{hit}(you) \\ r_{02}: \text{hung} \leftarrow \text{hang}(you), \text{hit}(you) \end{array}}$$

$$\mathcal{T}$$

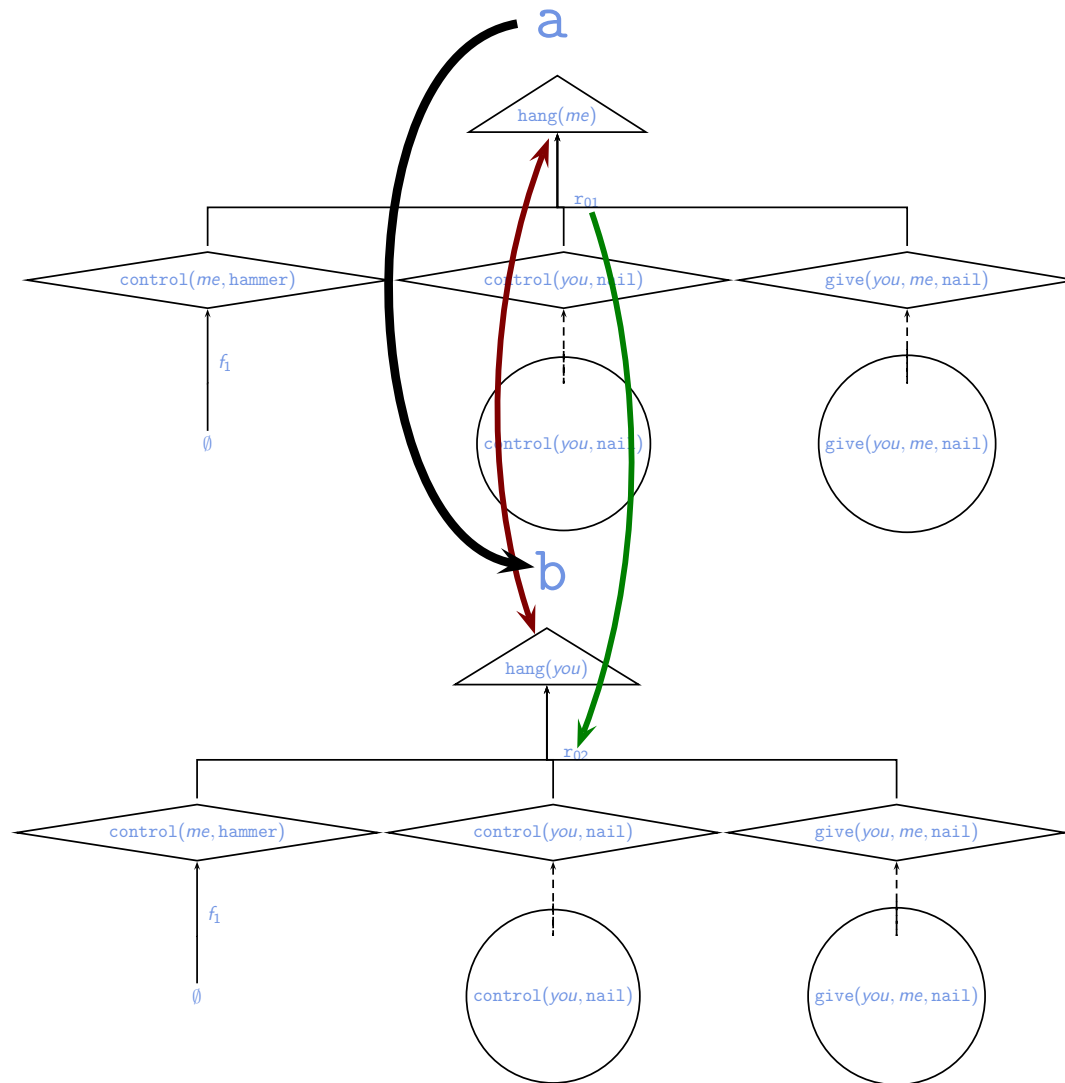
$$\begin{array}{l} r_{11}: \text{hang}(me) \leftarrow \text{give}(you, me, \text{nail}), \text{control}(me, \text{hammer}), \\ \quad \text{control}(you, \text{nail}) \\ r_{12}: \text{hang}(you) \leftarrow \text{give}(me, you, \text{hammer}), \text{control}(you, \text{nail}), \\ \quad \text{control}(me, \text{hammer}) \\ r_{21}(ag): \text{hit}(ag) \leftarrow \text{control}(ag, \text{hammer}) \\ f_{22}(ag): \neg\text{hit}(ag) \leftarrow \end{array}$$

$$\mathcal{T}$$

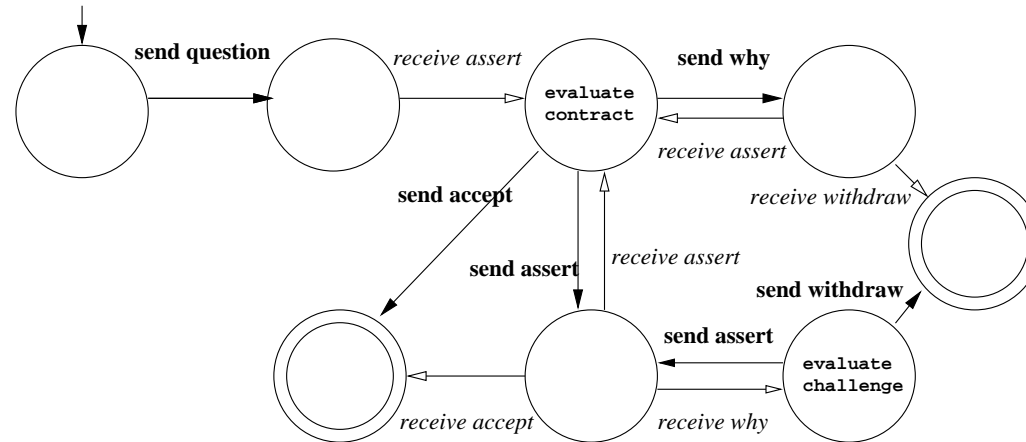
$$\frac{\mathcal{T}}{f_1 : \text{control}(me, \text{hammer}) \leftarrow}$$



Interaction between tree arguments



Drive communication



Corresponding pseudo-code representation:

```

IF receive assert(G,D,K) from interlocutor THEN
  update commit(interlocutor, [G,D,K]);
  IF evaluate(G,D,K) THEN
    send accept(G,D,K) to interlocutor;
    commit(me, [G,D,K]);
  ELSE IF evaluate(G,D2,K2) AND D2!=D THEN
    send assert(G,D2,K2) to interlocutor;
    commit(me, [G,D2,K2]);
  ELSEIF send why(G,D,K) to interlocutor;
  
```



Dialogue example: appeal to common goal, threat



M_k	S_k	H_k	A_k	R_k
M_0	alice	bob	question(hung, give(ag_1 , ag_2 , res), \emptyset)	θ
M_1	bob	alice	assert(hung, give(alice, bob, hammer), \emptyset)	M_0
M_2	alice	bob	assert(hung, give(bob, alice, nail), \emptyset)	M_1
M_3	bob	alice	why(hung, give(bob, alice, nail), \emptyset)	M_2
M_4	alice	bob	assert(hang(alice), give(bob, alice, nail), [control(bob, nail)])	M_3
M_5	bob	alice	accept(hung, give(bob, alice, nail), \emptyset)	M_1

M_k	S_k	H_k	A_k	R_k
M_0	alice	bob	question(hung, give(ag_1 , ag_2 , res), \emptyset)	θ
M_1	bob	alice	assert(hung, give(alice, bob, hammer), \emptyset)	M_0
M_2	alice	bob	assert(hung, give(bob, alice, nail), \emptyset)	M_1
M_3	bob	alice	why(hung, give(bob, alice, nail), \emptyset)	M_2
M_4	alice	bob	assert(\neg hit(alice), give(bob, alice, nail), [control(bob, nail)])	M_3
M_5	bob	alice	accept(hung, give(bob, alice, nail), \emptyset)	M_1



Take away: a model of autonomous, social, and argumentative agent trying to persuade each other to collaborate








- We have proposed:
 - A formalization of a social theory, **agents**, **resources**, and **goals**, as well as their **relationships**.
 - Apply Dung's seminal calculus of opposition.
 - Provide an argumentation-based social reasoning about individualistic/social/common goals through collaboration.
 - A model of internal dialectics between the individual goals and the social goals of agents.
- In the future:
 - M. Morge & K. Stathis **Arguing about motivations within a Argumnetative Agent Architecture**. To appear.



References



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 C. Sibertin-Blanc, F. Amblard, and M. Mailliard, **A coordination framework based on the sociology of organized action.** in *Proc of AAMAS 2005 International Workshops on Coordination, Organizations, Institutions, and Norms in Multi-Agent Systems*, volume 3913 of *Lecture Notes in Computer Science*, pp. 3–17. Springer Berlin, (2006).
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