

Argumentation Schemes in Multi-Agent Systems: A social Perspective

Alison R. Panisson Rafael H. Bordini

Pontifical Catholic University of Rio Grande do Sul (PUCRS)
Porto Alegre – RS – Brazil
alison.panisson@acad.pucrs.br

Contributions

- ▶ We propose a framework that combines argumentation schemes and social organisation in multi-agent systems
- ▶ In our framework, the agents' social context constrains the usage of argumentation schemes and their associated critical questions.
- ▶ We propose to extend the normative specification in order to ensure that agents make appropriate use of the argumentation schemes depending on the social context.

Argumentation Schemes

- ▶ Argumentation schemes are reasoning patterns for arguments
- ▶ The acceptance a conclusion from an instantiation of an argumentation schemes is directly associated with the so-called *critical questions*.
- ▶ Argumentation schemes may depend on the (social) context of the participating actors.
- ▶ Argumentation schemes could be specified for particular application in multi-agent systems context.
- ▶ Argumentation schemes could refer to social components, e.g., group structures, social roles, social plans and social norms.

Argumentation Schemes

For example, we introduce the argumentation scheme called *Argument from role to know in multi-agent systems*

*“Agent ag is currently playing a role R (its position) that implies knowing things in a certain subject domain S containing proposition A (**Major Premise**). ag asserts that A (in domain S) is true (or false) (**Minor Premise**). A is true (or false) (**Conclusion**)”*

CQ1: Does playing role R imply knowing whether A holds?

CQ2: Is ag an honest (trustworthy, reliable) source?

CQ3: Did ag assert that A is true (or false)?

CQ4: Is ag playing role R ?

Argumentation Schemes in Multi-Agent Systems

- ▶ Argumentation schemes could be specified for particular application in multi-agent systems context.
- ▶ We propose an infrastructure extending the MOISE organisational model — Soc^{ARG}

The MOISE model

The MOISE model has three main specification:

- ▶ *Structural specification*: behaviour of agents, agents relations (authority, communication, etc.), groups of agents
- ▶ *Functional specification*: schemes (decomposition tree) to achieve social (organisational) goals. Social plans allocated to the agents by *missions*
- ▶ *Normative specification*: explicitly states what is permitted and obligatory to agents playing roles within the organisation.

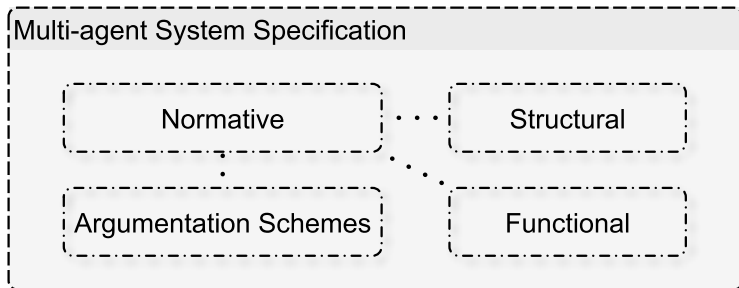


Figure: Soc^{ARG} links between specifications.

Extending the Normative specification

- ▶ We propose to extend the normative specification for $\langle id, dm, r, scope \rangle$, where *scope* can assume two forms:
 - ▶ *do(m)* considering the execution of a mission *m* (the usual case in MOISE model)
 - ▶ *use(as, ct)* referring the use of an argumentation scheme *as* and its respective constraints (context of a mission, exception of using critical questions, etc.).

Relations Among the Specifications

- ▶ Argumentation schemes and Structural specification
 - ▶ Argumentative groups of agents
 - ▶ Consistent argumentation schemes
- ▶ Argumentation schemes and Functional Specification
 - ▶ Contextual argumentation
- ▶ Argumentation schemes and Normative Specification
 - ▶ Norm-conforming argumentation
 - ▶ Norm-conforming claims
 - ▶ Norm-conforming questions

Features of the Soc^{ARG}:

- ▶ Communication control within the multi-agent specification
- ▶ Different application domains could require different constraints in regards to communication
- ▶ Argumentation Schemes shared by agents
- ▶ Argumentation Schemes referring to components of the organisation

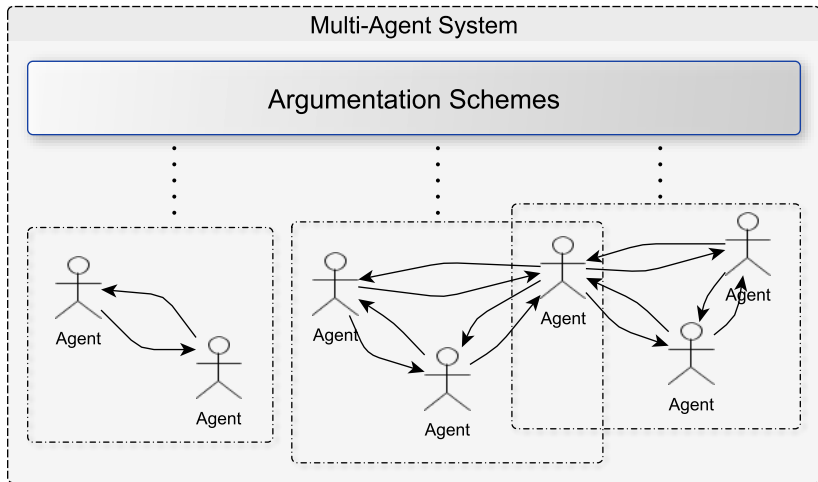


Figure: Our approach to argumentation schemes in multi-agent systems.

Instantiating Arguments from Argumentation Schemes

```
def_inf(Conclusion,  
        [role(Agent,Role),  
         role_to_know(Role,Domain),  
         asserts(Agent,Conclusion),  
         about(Conclusion,Domain)])  
        [as(role_to_know)].
```

Instantiating Arguments from Argumentation Schemes



Figure: Reasoning with Argumentation Schemes

Conclusions

- ▶ We propose a model for multi-agent systems called Soc^{ARG}
- ▶ The model extends multi-agent specification with an argumentation-scheme dimension that is connected with the organisational dimension of a multi-agent systems
- ▶ Our formalisation is inspired by the MOISE model, but other organisational models with similar abstractions can be used as well

Conclusions

- ▶ We extend the normative specification in order to link the others. Thus, functional, structural and argumentation-scheme specifications are independent from each other, being linked mostly through the normative specification.
- ▶ We describe the benefits of such model, including:
 - ▶ more control in the argumentation-based communication
 - ▶ the possibility to constrain agent's moves (in dialogues) by means of the normative specification, turning protocols, when they are norm-conforming, more efficient.

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