

# Structuring Organizations by Means of Roles Using the Agent Metaphor

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**Guido Boella**

Dipartimento di Informatica

Torino

**Leon van der Torre**

CWI - Amsterdam

# Research question

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- **Social reality** (organizations, institutions, groups, normative systems) is different from **physical reality**.
- **Object Orientation** takes as its **metaphor** physical reality: objects **exist** by themselves and can be **structured** in **complex objects**.
- Is the OO metaphor **applicable** to Social reality?

# Research question

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- Agent orientation is **flatter**: agents are not **components** of other more complex agents.
- How can **organizations** and **institutions** of autonomous agents be **structured**?
- How **agents** can be used to **explain** Social reality?

# Construction of social reality

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- **Searle's construction of social reality**

“Some rules regulate antecedently existing forms of behaviour. For example, the rules of polite table behaviour regulate eating, but eating exists independently of these rules. Some rules, on the other hand, do not merely regulate an antecedently existing activity called playing chess; they, as it were, create the possibility of or define that activity. The activity of playing chess is constituted by action in accordance with these rules. Chess has no existence apart from these rules. The institutions of marriage, money, and promising are like the institutions of baseball and chess in that they are systems of such constitutive rules or conventions.

# Organizations as agents?

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- We analyse **social reality**, and in particular organizations, groups and normative systems using the **agent metaphor**
- We explain how people conceptualize social reality, reason and talk about it by **attributing to social entities mental attitudes as beliefs, desires and goals.**

# The intentional stance

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- **Dennet:** attitudes like belief and desire are folk psychology concepts that can be fruitfully used in explanations of rational human behavior.

For an explanation of behavior it does not matter whether one **actually possesses these mental attitudes**: we describe the behavior of an affectionate cat or an unwilling screw in terms of mental attitudes.

Dennet calls treating a person or artifact as a rational agent the 'intentional stance'.

# Organizations are not flat

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- Organizations are more than **groups** of agents (J. Ferber, O. Gutknecht, and F. Michel, 2003)
- ... are more than **collections of roles** plus **rules** (F. Zambonelli, N.R. Jennings, and M. Wooldridge, 2003)  
(V. Dignum, J-J. Meyer, and H. Weigand, 2002)

# Organizations have:

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- Organization have **structures** in terms of
  - **functional areas** (FA) and
  - **roles** (RO)
- **Decomposition of goals** distributed among FA and RO
- **Control structure**: norms regulating what FAs and ROs do and which **powers** they have
- **Communication protocols** (documents)
- **Norms** addressed to organizations, FA and RO (legal persons)



# Construction of social reality

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- We extend **Searle**'s view of the **construction of social reality**
- Social entities are **created** by the **collective attribution** of a **status function**, e.g., money
- For **organization** the **status function** is described in terms of the **mental attitudes attributed to the organization**

# Construction principle

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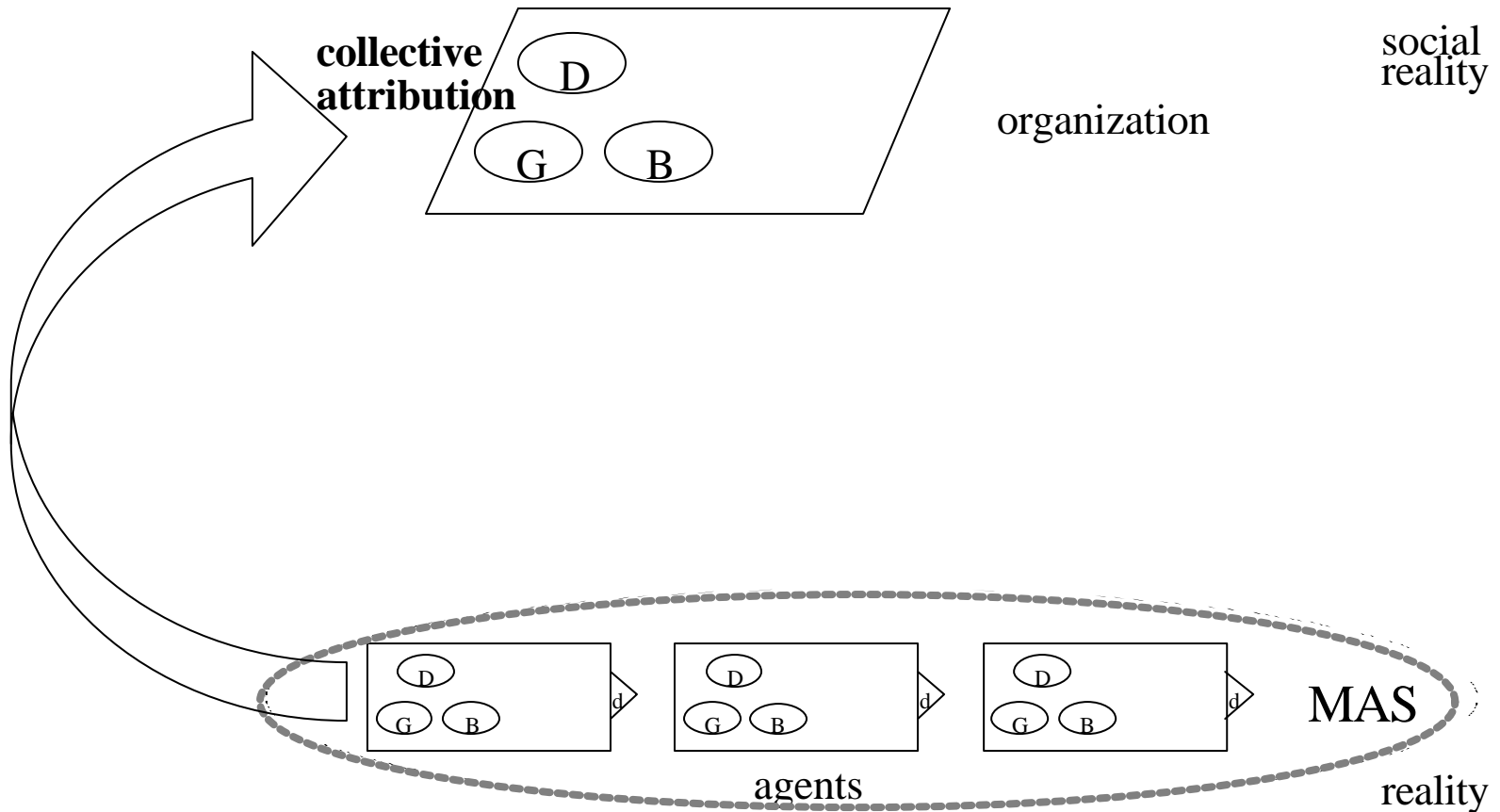
- Basic **ability** of agents is **attributing mental attitudes** to other agents for:
  - making **predictions** about their behavior (what they will do)
  - describing **expectations** (what they should do)
  - describing **social entities as agents**
- If social entities are seen as agents **they can attribute** in turn **mental attitudes to other social entities**

# Construction of organization

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- Organizations are constructed by means of the **attribution of mental attitudes** by the **agents** populating the society

# Organizations as agents

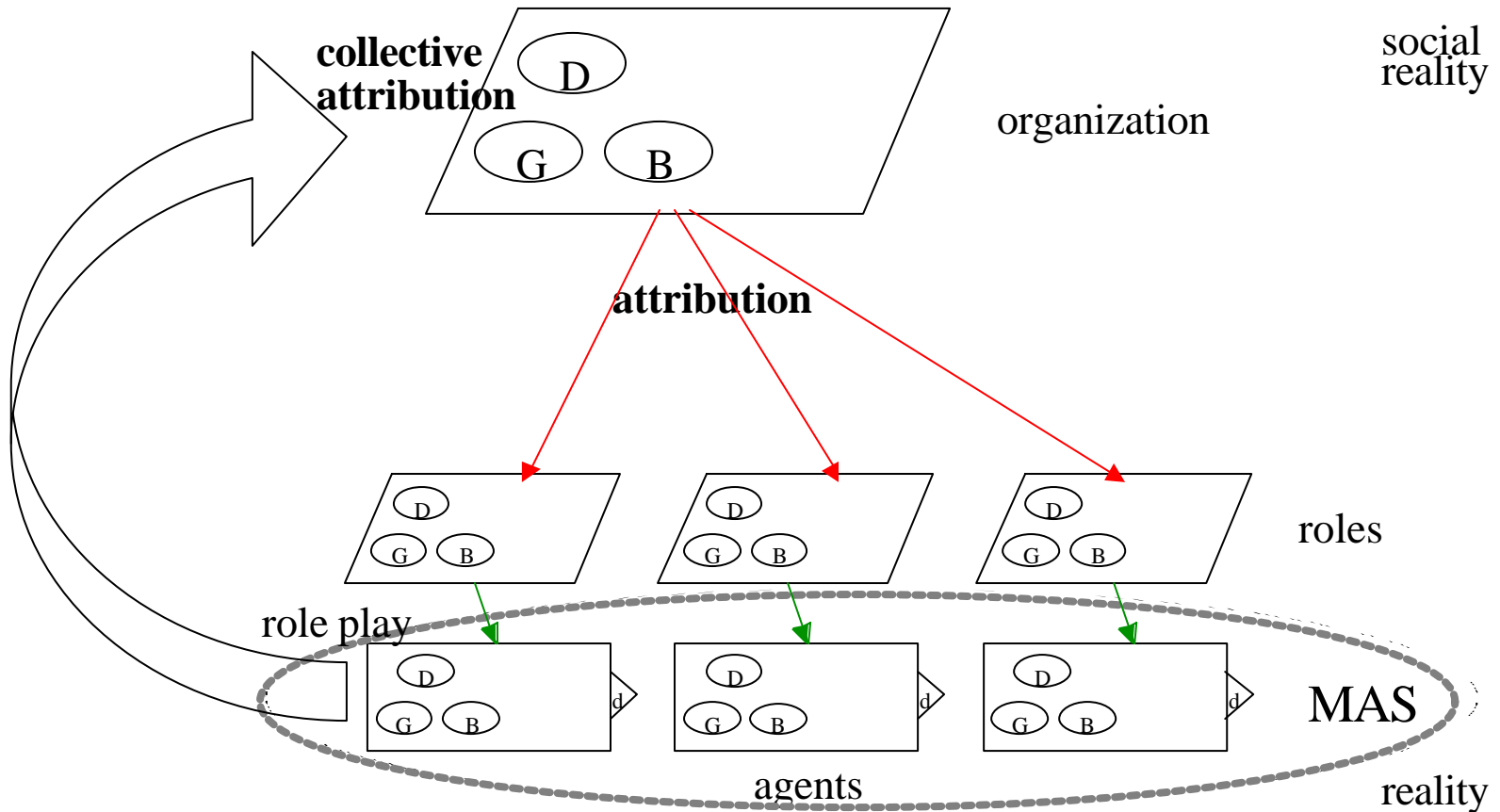


# Roles as agents

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- Roles are based on the **actor metaphor** (Goffman)
- Roles are descriptions of the **expected behavior** of the agents who will play the role: they are **attributed beliefs and goals by the organization**
- Role's beliefs represent the **expertise** and are different from the actor's ones
- Role's goals represent his **responsibilities**

# Organizations as agents

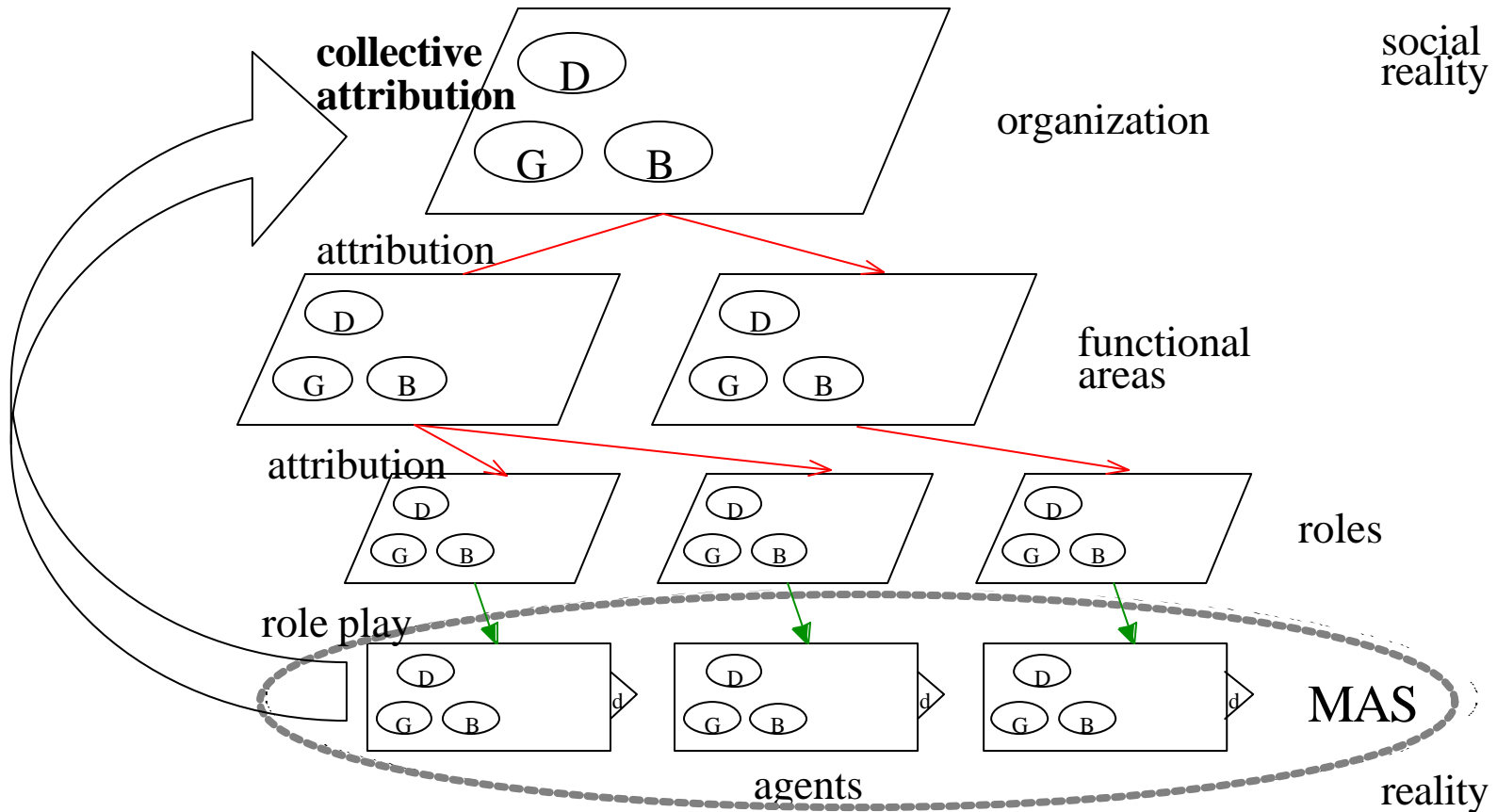


# Functional areas as agents

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- Functional areas and roles are constructed by means of **the attribution of mental attitudes by organizations** (and by **functional areas**, in turn)

# Organizations as agents





# Organizations are not objects

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- Agents have no agents as their **parts**.
- Functional areas and roles are **not parts** of **organizations** in the OO sense.
- They **do not exist** independently of the organization (**foundation**), while the organization does.
- The parts do not determine the whole, but the **whole determines the parts (definitional dependence)**
- Roles and FA have **powers** given by the organization

# MAS= $\langle A, X, B, G, AD, \geq \rangle$

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- $X$  propositional variables
- $\geq \subseteq 2^G \times 2^G$  priorities for conflict resolution
- **AD:  $A? 2^X \hat{=} B \hat{=} G \hat{=} A$  Agent description**
- **$A = RA \hat{=} OA \hat{=} FA \hat{=} RO$**

real agents, organizations, functional areas, roles

# Future work: `powerJava`

## (in cooperation with M. Baldoni)

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- How can **OO programming languages** model Social entities if they aren't objects?
- We introduce in Java the notion of **role and institution/organization**: new definitions of Object to model Social entities in OO languages
- Roles are **definitional dependent, founded** and endowed with **powers** (access to private fields of the institution)
- `powerJava` allows **separation of concerns, exogenous coordination** and new **encapsulation** rules

# Conclusions

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- Besides organizations, **groups and normative systems** can be modelled as agents, as well as legal institutions as contracts
- **Dialogue games** can be modelled as normative systems specifying roles
- **ANNOUNCEMENT:**  
We are organizing the  
*Coordination and Organization Workshop*  
**CoOrg05** at COORDINATION 2005 conference

**Papers and cfp:** <http://normas.di.unito.it>

- Permission and Authorization in Policies for Virtual Communities of Agents. In Procs. of P2P Agent workshop at AAMAS'04, NY.
- Regulative and constitutive norms in normative multiagent systems. In Procs. KR'04
- Contracts as legal institutions in organizations of autonomous agents. In Procs. of AAMAS'04,
- Attributing mental attitudes to normative systems. In Procs. of AAMAS'03, Melbourne
- The distribution of obligations by negotiation In Procs. of ECAI'04, Valencia, 2004.
- Local policies for the control of virtual communities. In Procs. of IEEE/WIC WI'03, Halifax
- Decentralized Control: Obligations and permissions in virtual communities of agents. In Procs. of ISMIS'03, Maebashi
- Norm Governed Multiagent Systems: The delegation of control to autonomous agents. In Procs. of IEEE/WIC IAT'03, Halifax
- Permissions and obligations in hierarchical normative systems. In Procs. of ICAIL'03, Edinburgh

