

Multiagent Systems

Jomi Fred Hübner

Universidade Federal de Santa Catarina
Departamento de Automação e Sistemas
<https://jomifred.github.io/mas/>

PósAutomação



Definitions

- ◆ An MAS is a loosely coupled network of problem solvers that interact to solve problems that are beyond the individual capabilities or knowledge of each problem solver (Durfee and Lesser 1989)
- ◆ These problem solvers, often called agents, are autonomous and can be heterogeneous in nature

Definitions

- ◆ An MAS is a loosely coupled system of problem solvers that interact to solve problems that are beyond the capabilities or knowledge of a single solver (Durfee and Lesser, 1990)
- ◆ These problem solvers are autonomous and distributed in nature

Characteristics

- ◆ agents with incomplete information and limited capabilities
- ◆ distributed
- ◆ decentralised (no global control)
- ◆ computation is asynchronous

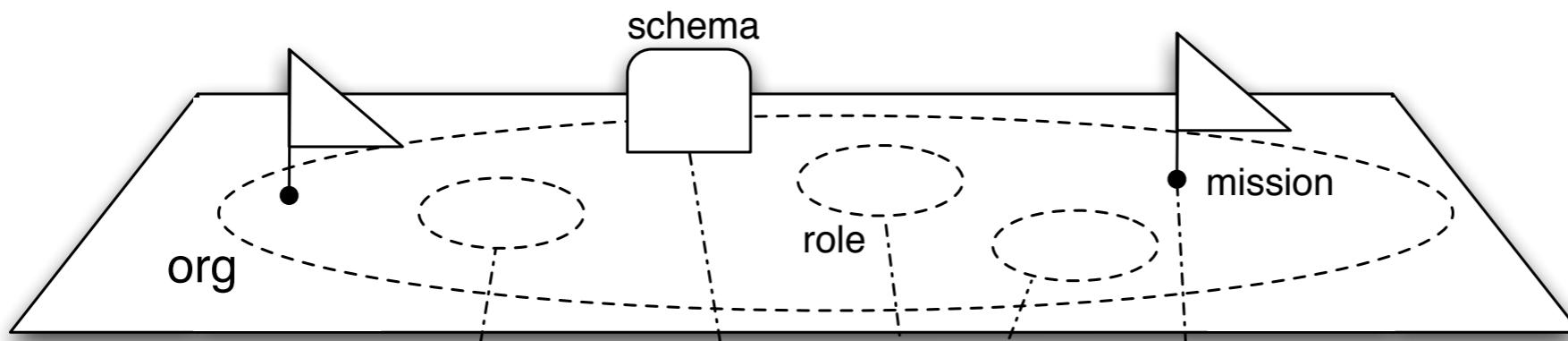
Our definition

- ◆ an organisation of autonomous agents interacting together within a shared environment
- ◆ conceptual and practical tools to design and implement distributed, complex, huge, open, systems

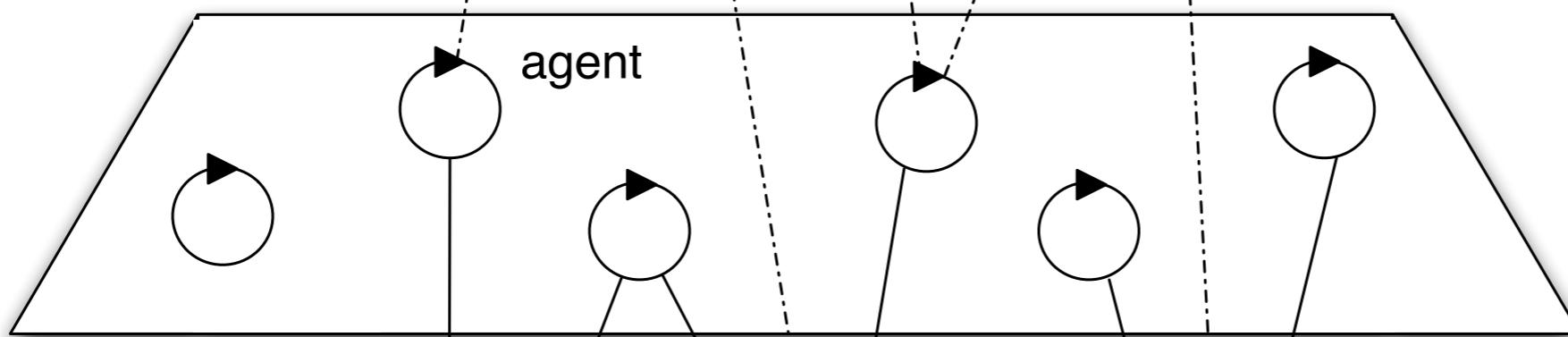
Our definition

- ◆ an organisation of autonomous agents interacting together within environment
- ◆ conceptual and practical tools to design and implement distributed, complex, huge, open, systems

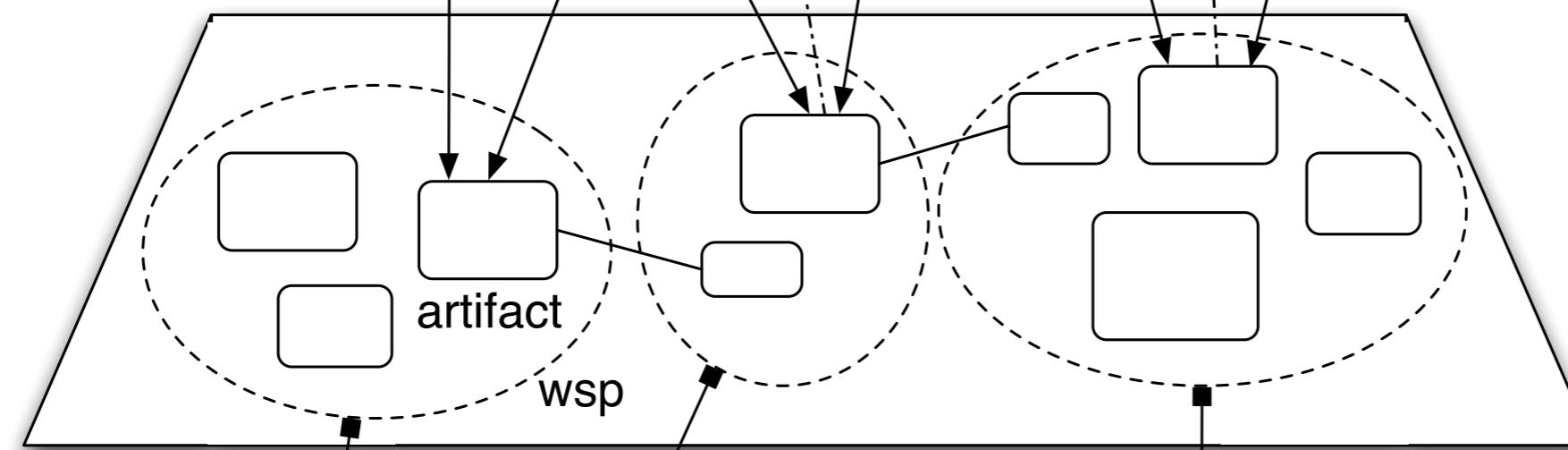
a s under
development



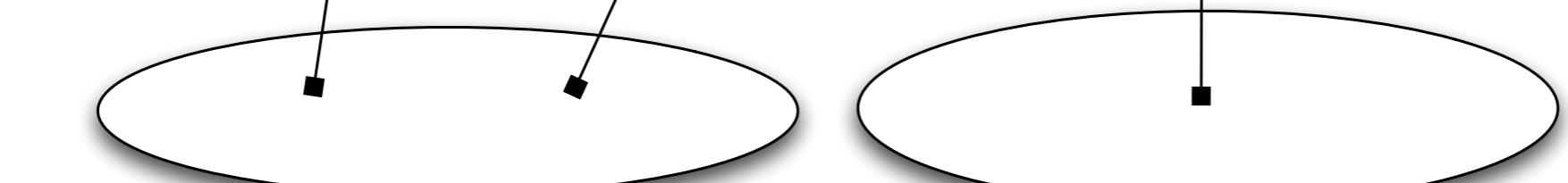
ORGAMISATION
LEVEL



AGENT
LEVEL

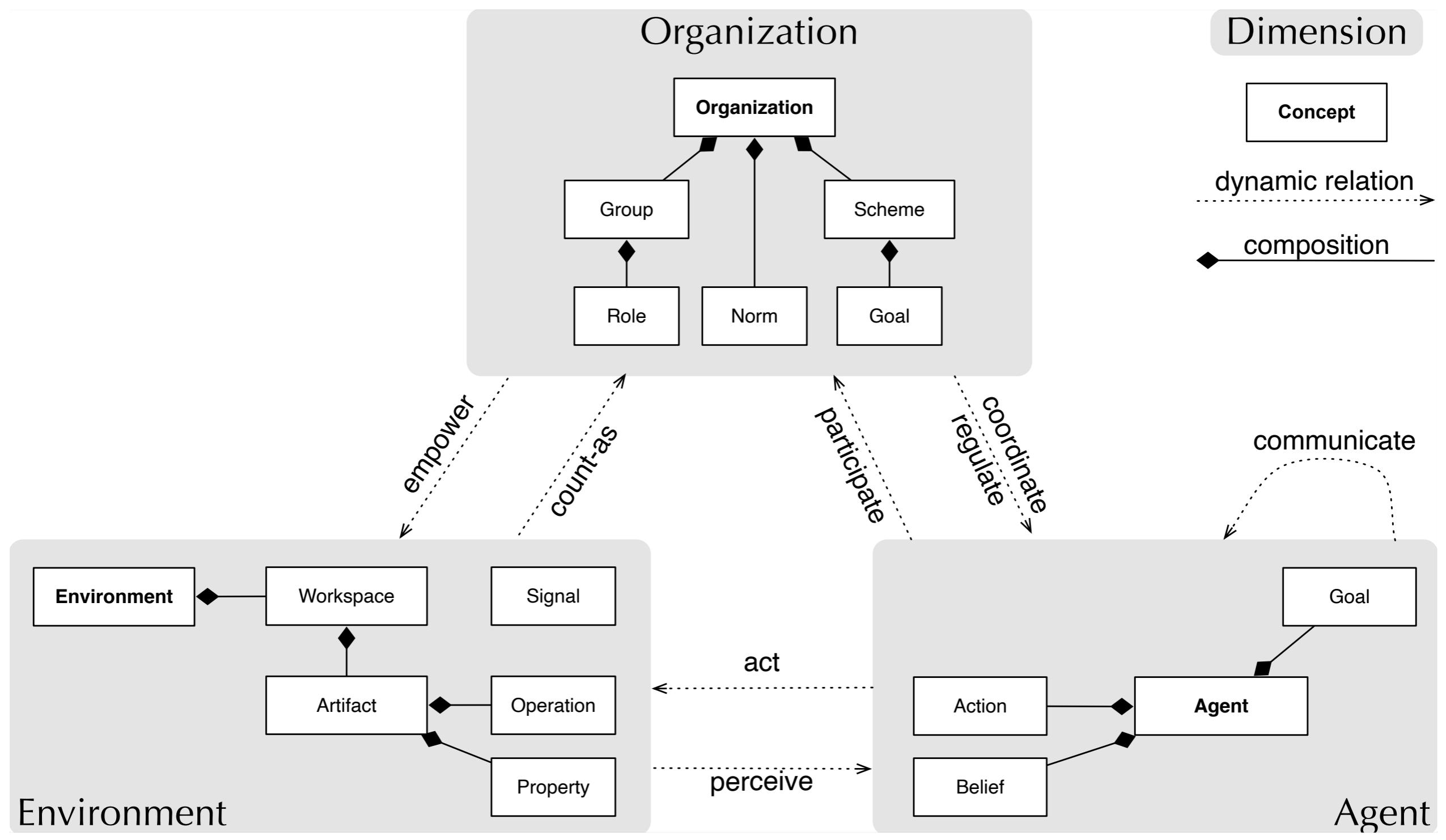


ENDOGENOUS
ENVIRONMENT
LEVEL



EXOGENOUS
ENVIRONMENT

network node



JaCaMo perspective

- ◆ MAS components are first class entities
 - ◆ Agents, Environment, Interactions, Organisation
[vowels view from Demazeau]
- ◆ Jason + CArtAgO + Moise + ...
- ◆ JaCaMo is a joint work with
Bordini, Ricci, Santi, and Boissier

Agent programming

- ◆ Autonomous entities of the system
 - ◆ encapsulate state, behaviour, control
- ◆ BDI theory
 - ◆ practical reasoning
 - ◆ reactivity + long term goals

Agent pro

high level abstraction

beliefs, plans, and
intentions

- ◆ Autonomous entities

- ◆ encapsulate state,

- ◆ BDI theory

naturally concurrent,
distributed, decoupled,
open, ...

- ◆ practical reasoning

- ◆ reactivity + long term goals

Environment Programming

- agents inhabit an environment
- interaction model is based on perception and actions
- agents need tools
- tools are not agents and agents are not tools

Agent & Artifacts

Organisational Programming

- ◆ control [malicious] agents
- ◆ help agents to [cooperatively] achieve goals
- ◆ simplifies reasoning about the organisation

Our approach

- ◆ programming
MAS
- ◆ runtime and
design time

from AOP
to
MAOP

Applications

- ◆ Multi robot systems
 - ◆ group task allocation, team formation, multiagent path planning
- ◆ Games (e.g. Age of Empires)
- ◆ Social Simulation
- ◆ Air Traffic Control
- ◆ Supply chain management
- ◆ RoboCup (rescue)
- ◆ ...

Applications

- ◆ Multi robot systems
 - ◆ group task allocation, team formation, multiagent path planning
- ◆ Games (e.g. Age of Empires)
- ◆ Social Simulation
- ◆ Air Traffic Control
- ◆ Supply chain management
- ◆ RoboCup (rescue)
- ◆ ...

top down
or
bottom up

Applications

- ◆ Multi robot systems
 - ◆ group task allocation, team formation
- ◆ Games (e.g. Age of Empires)
- ◆ Social Simulation
- ◆ Air Traffic Control
- ◆ Supply chain management
- ◆ RoboCup (rescue)
- ◆ ...

MAS used as

- ◆ a way to approach the problem
- ◆ a method to specify the system
- ◆ languages to program the system

or
bottom up

Bibliography

MAOP book

