Building Distributed and Robust Multi-agent Systems

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distance to goal

opponent position

sensors

actuators

shoot ball
Autonomy
Proactiveness
Reactivity
Social ability
A day in an agent's life
A day in an agent's life

Leaves home
Walks to the office
Works
Walks home
DESIRES

BELIEFS

INTENTIONS
BELIEFS

at(home)
I want to go to work
To go to work I need to leave home and walk to the office
The central idea is that we can architect computer programs as if they have a ‘mental state’.
go_to(work)
go_to(work)

leave(home)
get_to(work)
go_to(work)

leave(home)
get_to(work)

walk_to(work)
go_to(work)

leave(home)
  get_to(work)

get_to(work)

walk_to(work)

drive_to(work)
A day in an agent's life

If it rains & has key & car is near
drives to the office
Otherwise
walks to the office
How do I program that?
How do I program that?
How do I program that?
Implements the BDI architecture and the reasoning cycle
at(home). //Beliefs
!get_to_work. //Desires

//Plans
+!get_to_work: at(home) <- !leave(home);
   !drive_to(work).
+!leave(home) <- -at(home);
+at(street).
Multiagent systems
!start.
+!start: true <- .send(Alice,tell,hello)
Jason problems

Concurrency
Lacks distribution mechanisms
Lacks fault-tolerant mechanisms
https://github.com/avalor/eJJason
Corrects some of the concurrency problems
Distribution and fault-tolerant mechanisms in Jason
eJason interpreter implemented in Erlang
Concurrency problems

- go(home)
- tidy(kitchen)
- at(office)
Fault-tolerance
Fault detection: monitoring
Monitoring in eJ Jason

Agent appearance (reconnection or newly spawned)
Agent presence (availability)
Agent revival/restart (due to supervision)
Monitoring in eJason

- Notifications as beliefs
- Monitors persist
Fault recovery
eJason supervision

- Dynamic supervision trees
- Decoupling of supervisor and children
eJason new supervision capabilities

Tom ping Alice
eJason new supervision capabilities
eJason new supervision capabilities
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Fault Tolerance

Distribution

Multi-agent Systems Programming

Distributed and Fault Tolerant Multi-agent Systems
Thanks