SYLLABUS DEL CORSO

Advanced Distributed Systems Development with Multiagent Systems

1920-87R-02

Aims

Multiagent systems are a general purpose paradigm to design distributed systems, where autonomous entities collaborate to solve complex problems.

This phd course aims at presenting the MAS paradigm from both a design and implementation point of view: the foreseen audience is a student interested in learning a paradigm for modelling a complex system, where distributed (physically but above all logically) entities/components need to cooperate to solve a problem. These kind of systems may be adopted to solve very different types of problems, so the course may help in facing complex systems in very different research areas, and is not tailored for AI students only.

The main aspects that characterize the distributed systems that may benefit of a MAS architectural solution will be presented: the first aim of the course is to let the students begin thinking "how a MAS solution could help in this situation? How could I model it? Which platform could I use?". This skill may help in any situation where a complex system need to be modeled.

Second, we will focus on the two main MAS platforms, JADE and JASON (with the JaCaMo platform), with real MASs example and practical teaching sessions.

Teachers: dott. Briola Daniela (University of Milan Bicocca) (5hrs), Prof. Rafael Bordini (Pontificia Universidade Catolica do Rio Grande do Sul, Porto Alegre/RS - Brazil)(5 hrs) and prof. Viviana Mascardi (University of Genoa, Italy)(5 hrs)

Contents

Educational goals:

- Modeling a complex system as a MAS: main approaches, problems and solutions (with real examples presented) --> "designing a MAS" skill

- Main aspects of designing an OWL ontology, and implementation with Protegè

- BDI paradigm (main features)

- JASON modelling and programming skills, basic features

- A&A paradigm

- The JaCaMo platform (including Moise and Cartago)

- JADE modelling and programming skills, basic and advances aspects

- JADE extensions:

- OntologyBeanGenerator (to integrate OWL ontologies)

- JADE as a P2P platform (LEARN platform)

- Interfaces with WebServices and other languages

Both JADE and JaCaMo will be presented with practical lesson, where students will reproduce on their laptop, programming, the "tutorial" done by the teachers.

Detailed program

Introduction to MultiAgent systems (4hrs):

- What is a Multiagent system (MAS)?

- Specific aspects of MAS
- When a MAS can be a good solution?
- MAS and Simulation with MASs

- Platforms overview

Ontologies and thier role in MAS

- What is an ontology?
- How they are used in MASs
- Developping an ontology (Protegè)

- Some example of real MASs, developped in JADE.

Jason (5hrs):

- Introduction to BDI agents and to the speech act theory (1h)
- Introduction to Jason (1h)
- Lab on "strong" agenthood: the agent's belief base and the logic-based reasoning mechanism it supports (1h)
- Lab on social ability: communication in Jason (1h)
- Lab on situatedness: environment in Jason (1h)

For the practical part, students can follow and replicate the demos.

JaCaMo (5hrs):

- An introduction to CArtAgO (1/2 hour)
- An introduction to Moise (1/2 hour)
- An overview of the JaCaMo platform (1 hour)
- Examples of JaCaMo systems (1 hour)
- Practical session with exercises on JaCaMo development:
    - Voting system (1 hour)
    - Ontologies (1 hour)

JADE (6hrs):

- The JADE platform:

- Platforms and containers

- Agent life cycle
- Behaviours
- Scheduling
- DF and AMS
- Message Exchange
- WebServices and Agents

- Exploiting ontologies in JADE: OntologyBeanGenerator 5

- Turning Jade into a p2p platform

Practical examples and programming exercises will be provided during this part (and repliceted by the students on their laptop)

Prerequisites

- A basic background common to computer scientists

- JAVA is the language of both the platforms, so a basic knowledge of it (or of a similar OO language) is required to let the students fully exploit the practical sessions: nevertheless, it is not a strict requisite
- Knowledge of ontologies would avoid the part of the course regarding them, and we could move directly to the JADE integration and some more examples. To be defined with the students with the students

Teaching form

Teoric lessons and practical sessions (done by the students on their laptop, or in a lab if needed) following in real time the demo presented by the teachers)

Textbook and teaching resource

- Jade Book (Developing Multi-agent Systems with JADE)

  https://jade.tilab.com/documentation/book/

  JASON

http://jason.sourceforge.net/jBook/jBook/Home.html

Students should install on their laptop:

JaCaMo

http://jacamo.sourceforge.net/

https://www.sciencedirect.com/science/article/pii/S016764231100181X

To install JaCaMo as an Eclipse plugin, students need to first install Eclipse and then follow exactly these instruction (being careful about which URL to use depending on the version of Eclipse):
http://jacamo.sourceforge.net/eclipseplugin/tutorial/
There are other ways to use JaCaMo that does not require Eclipse:
http://jacamo.sourceforge.net/doc/install.html

- Protegè 3.5
- OntoloyBeanGenerator
- JADE

Semester

- 22/1: 14:00 - 16:00, Sala Seminari, Daniela Briola

- 23/1: 14:00 - 16:00, Sala Seminari, Daniela Briola

- 28/1: 14:00 - 17:00, Sala Riunioni primo piano, Viviana Mascardi

- 29/1: 9:30 - 11:30 U14, T023, Viviana Mascardi

- 4/2: 14:00 - 17:00, Sala Riunioni primo piano, Rafael Bordini

- 5/2: 9:30 - 11:30, Sala Riunioni primo piano, Rafael Bordini

-11/02: 13:30 - 15:30, Sala Riunioni primo piano, Daniela Briola

-12/02: 10:00 - 12:00, Sala Riunioni primo piano, Daniela Briola

-13/02: 10:00 - 12:00, Sala Riunioni primo piano, Daniela Briola

Assessment method

Students will be asked to perform one of two different assessment (to be decided with each students):

- producing a detailed (and formal, where possible) design of a MAS, starting from a natural language description of a complex problem

- producing a running MAS (in JADE or JaCaMo) starting from an already prepared design of a MAS

Office hours

On appointment: daniela.briola@unimib.it