ID2209 Distributed Artificial Intelligence and Intelligent Agents 7.5 credits

Distribuerad AI och Intelligenta Agenter

Course syllabus for ID2209 valid from Autumn 19

This is a translation of the Swedish, legally binding, course syllabus.

Grading scale: A, B, C, D, E, FX, F
Education cycle: Second cycle
Main field of study: -

Intended learning outcomes

Having passed the course, the student should be able to:

- formulate definitions of the most important concepts and the methods for intelligent agents and multi-agent systems
- evaluate and use the most important concepts and the methods in the area for intelligent agents and multi-agent systems.

Course main content

- Introduction and basic concepts for DAI (distributed artificial intelligence).
- Coordination methods general models, joint coordination techniques, organizational structures, information exchange on the metalevel, multi-agent planning, explicit analysis and synchronisation.
- Negotiation methods: principles, protocols, production sequencing as negotiations, conventions for automatic negotiations.
- Interoperability: Methods for interoperation of software, speech acts, KQML, FIPA.
- Multi-agent architectures: Low-level architectural support, DAI-testbeds, agent oriented software development.
- Agent theory: Fundamentals of modal logic, the BDI architecture.
- Agent architectures: deliberative, reactive and hybrid architectures.
- Mobile agents: requirements, implementation, safety for mobile agents, environments for mobile agents. Agent typology and technical questions. Applications.
- Practical part of the course that contains exercises and a project that includes implementation of a multi-agent system.

Language of instruction

Language of instruction is specified in the course offering information in the course and programme directory.

Eligibility

Literature

Textbook for the course:

M. J. Wooldridge. An Introduction to Multi-Agent Systems, John Wiley & Sons, 2009, Second Edition.

Lecture notes

Recommended Reading (not in curriculum):

The following articles are recommended to obtain a deeper understanding of the subject. We have provided links to the articles wherever possible.

Introduction, Overview and Terminology

- B. Moulin, B. Chaib-draa. An Overview of Distributed Artificial Intelligence. In: G. M. P. O'Hare, N. R. Jennings (eds). Foundations of Distributed Artificial Intelligence, John Wiley & Sons, 1996, pp. 3-56.
- S. Franklin and A. Graesser. Is it an Agent, or just a Program?: A Taxonomy for Autonomous Agents. Proceedings of the Third International Workshop on Agent Theories, Architectures and Languages, Springer-Verlag, 1996, pp. 21-35.

Negotiation

- J. Rosenschein and G. Zlotkin, Rules of Encounter, MIT Press, 1994, ISBN 9 780262 181594. (Chapters 1, 2 and 3).
- R. Davis and R. G. Smith, Negotiation as a Metaphor for Distributed Problem Solving, (A. H. Bond and L. Gasser eds.) Readings in Distributed Artificial Intelligence, Morgan Kaufmann Publishers, 1988, p. 333-356.
- H. J. Muller. Negotiation Principles. In: G. M. P. O'Hare, N. R. Jennings (eds). Foundations of Distributed Artificial Intelligence, John Wiley & Sons, 1996, pp. 211-230.

Coordination

- E. H. Durfee, Distributed Problem Solving and Planning, in Multiagent Systems (G. Weiß ed.), MIT Press, Cambridge, MA., 1999, pp. 121-164.
- N. R. Jennings. Coordination Techniques for Distributed Artificial Intelligence. In: G. M. P. O'Hare, N. R. Jennings (eds). Foundations of Distributed Artificial Intelligence, John Wiley & Sons, 1996, pp. 187-210.
- H. Nwana, L. Lee, N. R. Jennings. Coordination in Software Agent Systems. The British Telecom Technical Journal, Vol. 14, No. 4, pp. 79-88.
- K. S. Decker. Distributed Artificial Intelligence Testbeds. In: G. M. P. O'Hare, N. R. Jennings (eds). Foundations of Distributed Artificial Intelligence, John Wiley & Sons, 1996, pp. 119-138.

Teamwork

- Cohen, P. R. and Levesque, H. J., Teamwork, Nous, 25, 1991.
- Tambe, M.,Towards

Flexible Teamwork, Journal of Artificial Intelligence Research, Volume 7, 1997, pp. 83-124.

- G. Tidhar and A. Rao and E. Sonenberg, Guided Team Selection, In Proceedings of the 2nd International Conference on Multi-agent Systems (ICMAS-96). Kyoto, Japan, 1996.

Agent Communication

- P. O`Brien, R. Nicol. FIPA - Towards a Standard for Software Agents. BT Technology Journal, Vol. 16, No. 3, pp. 51-59, 1998.
- Y. Labrou, T. Finin and Y. Peng, Agent Communication Languages: The Current Landscape, IEEE Intelligent Systems, 1094-7167, 1999.

Mobile Agents

- D. M. Chess, C. G. Harrison, A. Kershenbaum. Mobile Agents: Are they a good idea? Research Report, IBM Research Division, T.J.WatsonResearchCenter, 1995, 21 p.
- White, J. E., Mobile Agents, in Bradshaw, J. (ed.), Software Agents, MIT Press, Cambridge, MA, 1997, p. 437-472.

Agents Overview

- M. J. Wooldridge, N. R. Jennings. Intelligent Agents: Theory and Practice.Knowledge Engineering Review, 1995, 62 p.

Agent Theory

- Anand S. Rao, Michael P. Georgeff, Modeling Rational Agents within a BDI-Architecture, Proceedings of the 2nd International Conference on Principles of Knowledge Representation and Reasoning (KR'91), 1991.

Agent-Oriented Software Engineering

- M. Wooldridge, N. R. Jennings, and D. Kinny. The Gaia Methodology for Agent-Oriented Analysis and Design. In Journal of Autonomous Agents and Multi-Agent Systems. 3(3):285-312. 2000.
- E. Kendall et al. The Layered Agent Pattern Language. Proceedings of the Conference on Pattern Languages of Programs (PLoP'97), 1997.
- B. Bauer, J. P. Muller, and J. Odell. Agent UML: A Formalism for Specifying Multiagent Interaction. In Ciancarini and Wooldridge (Eds.) Proceedings of Agent-oriented Software Engineering, Springer Verlag, Berlin, 2001, pp. 91-103.
- M. J. Wooldridge, N. R. Jennings. Software Engineering with Agents: Pitfalls and Pratfalls. IEEE Internet Computing, May/June, pp. 20-27, 1999.
- A. Tveit. A Survey of Agent-Oriented Software Engineering. NTNU CSGSC, 2001.

Agent-Mediated Electronic Commerce

- R. H. Guttman, A. G. Moukas, P. Maes. Agent-mediated Electronic Commerce: A Survey. 10 p.
- R. H. Guttman, P. Maes. Cooperative vs. Competitive Multi-Agent Negotiation in Retail Electronic Commerce. Proceedings of the Second International Workshop on Cooperative Information Agents (CIA'98), Paris, France, July 3-8, 1998, 9 p.
- J. Collins, S. Jamison, B. Mobasher, M. Gini. A Market Architecture for Multi-Agent Contracting. Technical Report 97-15, University of Minnesota, May 1997, 12 p

Additional articles in the curriculum may be added during the course

Examination

- ANN1 - Assignment, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F

Written examination.

In agreement with KTH´s coordinator for disabilities, it is the examiner who decides to adapt the examination for students in possession of a valid medical certificate. The examiner may permit other examination forms at the re-examination of few students