Topics To Be Covered Today ................................................................. 2
What Are Software Agents ............................................................... 3
Single Agents .................................................................................... 4
Multi-Agent Systems .......................................................................... 5
Agent Technology and Artificial Intelligence (AI) .............................. 6
How to Develop A Single Agent? ..................................................... 7
How to Develop Multi-Agent Systems .............................................. 8
Semantic Web is for AGENTS!! ......................................................... 9
Agent Technology and Data Mining .................................................. 10
Two Interesting Agent Competitions ................................................. 11
Topics To Be Covered Today

■ What Are
  — software agents
  — multi-agent systems
■ Relevant Disciplines and Technical Foundation
■ Agent Technology + Data Mining
■ Selected Case Studies

What Are Software Agents

■ Agent as a term is overloaded
■ Software agents are computational systems that
  — have goals, sensors, and effectors in a networked infrastructure (softbot vs. robot)
  — interact with other agents/users
  — are autonomous
  — are adaptive
  — are proactive
  — are long lived

Single Agents

■ Automated problem solvers
■ User task delegation
■ May be able to learn from past experience
■ Examples: intelligent interfaces, NASA “deep space I” remote agent

Multi-Agent Systems

■ Multiple agents working together to solve problems
■ Two main classes:
  — Distributed Problem Solving (DPS) (e.g., distributed sensor networks)
  — Multi-Agent Systems (e.g., negotiation support systems)
Agent Technology and Artificial Intelligence (AI)

- Agent technology is inherently multi-disciplinary
- AI is the main contributing academic discipline for agent-related research and technology development.
- Other related academic fields:
  - Distributed systems and networks
  - Economics and game theory
  - Linguistics and information retrieval
  - Software engineering
  - Human-computer interaction

How to Develop A Single Agent?

- Knowledge representation (logic, frame, semantic net, etc.)
  - JESS and FOPL/theorem proving (http://fipa-os.sourceforge.net/features.htm)
- Automated problem solving (search, AI planning, etc.)
  - GraphPlan (http://www.cs.cmu.edu/~avrim/graphplan.html)
- Interface design
- Adaptive behavior (machine learning/data mining)
- Toolkits: JADE; FIPA-OS standards

How to Develop Multi-Agent Systems

- All the above +
- Communication mechanisms
  - Historic: Speech Act/KQML
  - Current: DAML = XML + Ontologies
- Coordination
  - Cooperative (contract nets)
  - Strategic

Semantic Web is for AGENTS!!

- DARPA Agent Markup Language: as an extension to XML and the Resource Description Framework (RDF).
  DAML+OIL provides a rich set of constructs with which to create ontologies and to markup information so that it is machine readable and understandable
Agent Technology and Data Mining

- “Intelligent” agent: data mining and adaptive behavior make agents act smartly
- Intelligent data mining systems: agent technology helps make data mining systems better
- MAS presents unique data mining problems
  - Mining strategic interaction data
  - Distributed data mining
- MAS provides interesting data mining solutions
  - Prediction market

Two Interesting Agent Competitions

- RoboCup (www.robocup.org)
  “By the year 2050, develop a team of fully autonomous humanoid robots that can win against the human world soccer champion team.”
- Trading agent competition: travel “agents,” supply chain management, online ads management, market-makers
- Data mining plays an essential role in these competitions

- Visit agents.umbc.edu to learn more about agent technology and its applications