CHAPTER 1: INTRODUCTION

Multiagent Systems

http://www.csc.liv.ac.uk/~mjw/pubs/imas/

Chapter 1: An Introduction to Multiagent Systems 2e

Five Trends in the History of Computing

Ubiquity

Interconnection

Continual reduction in cost of computing makes it possible to introduce processing power into places that would have once been uneconomical.

What could benefit from having a processor embedded in it?

As processing capability spreads, sophistication (and intelligence of a sort) becomes ubiquitous.

What could benefit from having a processor embedded in it?

Interconnected networks are no longer stand alone, but are

Interconnection

A processing capability spreads, sophistication (and intelligence of a sort) becomes ubiquitous.

Ubiquity

human-orientation,
deligation,
intelligence!
interconnection!
ubiquity!

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Multiagent Systems

CHAPTER 1: INTRODUCTION
The complexity of tasks that we are capable of automating and delegating to computers has grown steadily. If you don't feel comfortable with this definition of "intelligence," it's probably because you are a human...

...Human Orientation...

Programming has progressed through:
- agents.
- to
do-objects:
  - abstract data types;
  - procedures & functions;
  - sub-routines;

- machine-independent programming languages:
  - assembly language;
  - machine code;

Programming has progressed through:
- abstractions in terms of ever higher-level – more human-oriented – programming concepts and implementation software
  - Programs and users (and users) relate to the machine differently
  - Programmers (and users) relate to the machine more closely reflect the way we ourselves understand programming toward concepts and metaphors that/the world
The movement away from machine-oriented views of

...Intelligence...

Computers are doing more for us... without our... Delegation

Next on the agenda. If-by-wire cars, intelligent... experienced pilot

...Intelligence" is probably because you are a human... steadily

...Intelligence" is probably because you are a human...
Chapter 1  An Introduction to Multiagent Systems

Other Trends in Computer Science

• the Grid;
• ubiquitous computing;
• semantic web.

The Grid

The Grid

The Grid

The Grid

Chapter 1  An Introduction to Multiagent Systems
The Semantic Web

- The semantic web aims to annotate websites with semantic markup: information in a form processable by computer enabling better services to users.
- The idea is that this markup will enable browsers (etc) to assist in design decisions, rather than constantly needing to be told what needs to be done.
- Berners-Lee, 1999

Agents: A First Definition

An agent is a computer system that is capable of independent (autonomous) action on behalf of its user or owner (figuring out what needs to be done to satisfy design objectives, rather than constantly being told). In the most general case, agents will be acting on behalf of a number of agents with interests in conflict with one another.

Multiagent Systems: A First Definition

A multiagent system is one that consists of a number of agents, which interact with one another.
When a space probe makes its long flight from Earth to the outer planets, a ground crew is usually required to continually track its progress and decide how to deal with unexpected eventualities. This is costly and, if decisions are required quickly, it is simply not practicable. For these reasons, organisations like NASA are seriously investigating the possibility of making autonomous, self-navigating probes more autonomous — giving them more capability to make decisions. This is costly, as decisions are usually required to continually track its progress. When a space probe makes its long flight from

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**Agents as a paradigm for software engineering:**

- **Vision:** Autonomous probes
- **Vision:** Internet agents

- **Some views of the field:**
  - Agent design: How do we build agents that are capable of independent, autonomous action in order to successfully carry out the tasks that we delegate to the agents, particularly when the agents cannot be assumed to share the same interests/goals?
  - Society design: How do we build societies that are capable of interacting (cooperating, coordinating, negotiating) with other agents in order to successfully carry out the tasks that we delegate to the societies?

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**The Micro and Macro Problems**

- **Agent design:** How do we build agents that are capable of independent, autonomous action in order to successfully carry out the tasks that we delegate to them?
- **Society design:** How do we build societies that are capable of interacting (cooperating, coordinating, negotiating) with other agents in order to successfully carry out the tasks that we delegate to the societies?

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**Some views of the field:**

- **Agents as a paradigm for software engineering:**
  - Software engineers have derived a new paradigm for software engineering from work on autonomous probes. Perhaps due to network failures, or where resources are not always available, an agent would require synthesising given a query, the agent would perform the necessary search for the answer. It could then select a path that is likely to be successful, or a computer program — an agent — could be a long and tedious process. So, why spend the time to find the answer to a specific question?

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**A Vision: Autonomous Space Probes**

- **A Vision:** Autonomous probes
- **A Vision:** Internet agents
Multiagent systems provide a novel new tool for simulating societies, which may help shed some light on various kinds of social processes.

Agents as a tool for understanding human societies.

Objectons to MAS

• Isn't it all just Social Science?
• Isn't it all just Economics/Game Theory?
• Isn't it all just AI?
• Isn't it all just Distributed/Concurrent Systems?