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  - **Is it not all just economics/game theory?**
  - **Is it not all just social science?**

The Vision Thing

- It's easiest to understand the field of multiagent systems if you understand researchers' vision of the future
- Fortunately, different researchers have different visions
- The amalgamation of these visions (and research directions, and methodologies, and interests, and…) define the field
- But the field's researchers clearly have enough in common to consider each other's work relevant to their own

Search for that

- Spacecraft Control
- Deep Space 1
- Air Traffic Control
- Internet Agents

What if the agents become better?

- Internet agents need not simply search
- They can plan, arrange, buy, negotiate – carry out arrangements of all sorts that would normally be done by their human user
- As more can be done electronically, software agents theoretically have more access to systems that affect the real-world
- But new **research problems arise** just as quickly…

Research Issues

- How do you state your preferences to your agent?
- How can your agent compare different deals from different vendors? What if there are many different parameters?
- What algorithms can your agent use to negotiate with other agents (to make sure you get a good deal)?
- These issues aren't frivolous – automated procurement could be used massively by (for example) government agencies
- The Trading Agents Competition…

Multiagent Systems is Interdisciplinary

- The field of Multiagent Systems is influenced and inspired by many other fields:
  - Economics
  - Philosophy
  - Game Theory
  - Logic
  - Ecology
  - Social Sciences
- This can be both a strength (infusing well-founded methodologies into the field) and a weakness (there are many different views as to what the field is about)
- This has analogies with artificial intelligence itself

Some Views of the Field

- *Agents as a paradigm for software engineering*: Software engineers have derived a progressively better understanding of the characteristics of complexity in software.
- It is now widely recognized that *interaction* is probably the most important single characteristic of complex software
- Over the last two decades, a major Computer Science research topic has been the development of tools and techniques to model, understand, and implement systems in which interaction is the norm

Some Views of the Field

- *Agents as a tool for understanding human societies*:
  Multiagent systems provide a novel new tool for simulating societies, which may help shed some light on various kinds of social processes.
- This has analogies with the interest in "theories of the mind" explored by some artificial intelligence researchers

Some Views of the Field

- *Multiagent Systems is primarily a search for appropriate theoretical foundations:*
  We want to build systems of interacting, autonomous agents, but we don't yet know what these systems should look like

- This, too, has analogies with artificial intelligence research

Objections to MAS

- Isn't it all just Distributed/Concurrent Systems? There is much to learn from this community, but:
- Agents are assumed to be autonomous, capable of making independent decision – so they need mechanisms to synchronize and coordinate their activities at run time
- Agents are (can be) self-interested, so their interactions are "economic" encounters

Objections to MAS

- Isn't it all just AI?
- We don't need to solve all the problems of artificial intelligence (i.e., all the components of intelligence) in order to build really useful agents
- Classical AI ignored *social* aspects of agency. These are important parts of intelligent activity in real-world settings

Objections to MAS

- Isn't it all just Economics/Game Theory?
  These fields also have a lot to teach us in multiagent systems, but:
- Insofar as game theory provides *descriptive* concepts, it doesn't always tell us *how* to compute solutions; we're concerned with computational, resource-bounded agents
- Some assumptions in economics/game theory (such as a rational agent) may not be valid or useful in building artificial agents

Objections to MAS

- Isn't it all just Social Science?
- We can draw insights from the study of human societies, but there is no particular reason to believe that artificial societies will be constructed in the same way
- Again, we have inspiration and cross-fertilization, but hardly subsumption