LECTURE 1: INTRODUCTION

Multiagent Systems

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

1 Overview

- Five ongoing trends have marked the history of computing:
  - – *ubiquity*;
  - – *interconnection*;
  - – *intelligence*;
  - – *delegation*; and
  - – *human-orientation*.
- Programming has progressed through:
  - – sub-routines;
  - – procedures & functions;
  - – abstract data types;
  - – objects;

  to *agents*.

1.1 Spacecraft Control

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 probes more autonomous — giving them richer decision making capabilities and responsibilities.

This is not fiction: NASA's DS1 is doing it now!

1.2 Internet Agents

Searching the Internet for the answer to a specific query can be a long and tedious process. So, why not allow a computer program — an agent — do searches for us? The agent would typically be given a query that would require synthesising pieces of information from various different Internet information sources. Failure would occur when a particular resource was unavailable, (perhaps due to network failure), or where results could not be obtained.

- An agent is a computer system that is capable of *independent* action on behalf of its user or owner.
- A multiagent system is one that consists of a number of agents, which *interact* with one-another
- In order to successfully interact, agents need ability to *cooperate*, *coordinate*, and *negotiate*

- Two key problems:
  - 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?
  - How do we build agents that are capable of interacting (cooperating, coordinating, negotiating) with other agents in order to successfully carry out the tasks that we delegate to them, particularly when the other agents cannot be assumed to share the same interests/goals?

2 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 recognised that *interaction* is probably the most important single characteristic of complex software.

- *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.

3 Objections to MAS

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