CS378
Autonomous Multiagent Systems
Spring 2005

Prof: Peter Stone
TA: Nate Kohl

Department of Computer Sciences
The University of Texas at Austin

Week 7a: Tuesday, February 28th

Good Afternoon, Colleagues

Are there any questions?

Logistics

- Project proposal questions?

Logistics

- Project proposal questions?
- Next week's readings posted, survey soon to be assigned

Logistics

- Project proposal questions?
- Next week's readings posted, survey soon to be assigned
- Explore UT: Saturday 11–4:40

Logistics

- Project proposal questions?
- Next week's readings posted, survey soon to be assigned
- Explore UT: Saturday 11–4:40
- New resources
  - Paper on pair programming

Motivation from real insects

- Ant colonies exhibit remarkably complex behaviors
  - Food gathering
  - Burial
  - Nest building
  - Reproduction

Motivation from real insects

- Ant colonies exhibit remarkably complex behaviors
  - Food gathering
  - Burial
  - Nest building
  - Reproduction
- Individual ants aren't smart
  - The complexity is in the environment (Simon)

Motivation from real insects

- Ant colonies exhibit remarkably complex behaviors
  - Food gathering
  - Burial
  - Nest building
  - Reproduction
- Individual ants aren't smart
  - The complexity is in the environment (Simon)
  - They're easily fooled out of their element (Feynman)

Motivation from real insects

- Ant colonies exhibit remarkably complex behaviors
  - Food gathering
  - Burial
  - Nest building
  - Reproduction
- Individual ants aren't smart
  - The complexity is in the environment (Simon)
  - They're easily fooled out of their element (Feynman)

Model the ant, not the colony

Go to the Ant

- Complex system behavior from many simple agents

Go to the Ant

- Complex system behavior from many simple agents
- Complexity comes from interactions, the environment

Agent Definition

Agents tied to environment

- *Agent = <State, Input, Output, Process>*

Agent Definition

Agents tied to environment

- *Agent = <State, Input, Output, Process>*
- *Environment = <State, Process>*

Agent Definition

Agents tied to environment

- *Agent = <State, Input, Output, Process>*
- *Environment = <State, Process>*

Note: supports hierarchical agents

Examples from Nature

- Ants: path planning
- Ants: brood sorting
- Termites: nest building
- Wasps: task differentiation
- Birds and Fish: flocking
- Wolves: surrounding prey

Principles

- Try to avoid functional decomposition

Principles

- Try to avoid functional decomposition
- Simple agents (small, forgetful, local)

Principles

- Try to avoid functional decomposition
- Simple agents (small, forgetful, local)
- Decentralized control

Principles

- Try to avoid functional decomposition
- Simple agents (small, forgetful, local)
- Decentralized control
- System performance from interactions of many

Principles

- Try to avoid functional decomposition
- Simple agents (small, forgetful, local)
- Decentralized control
- System performance from interactions of many
- Diversity important: randomness, repulsion

Principles

- Try to avoid functional decomposition
- Simple agents (small, forgetful, local)
- Decentralized control
- System performance from interactions of many
- Diversity important: randomness, repulsion
- Embrace risk (expendability) and redundancy

Principles

- Try to avoid functional decomposition
- Simple agents (small, forgetful, local)
- Decentralized control
- System performance from interactions of many
- Diversity important: randomness, repulsion
- Embrace risk (expendability) and redundancy
- Agents should be able to share information

Principles

- Try to avoid functional decomposition
- Simple agents (small, forgetful, local)
- Decentralized control
- System performance from interactions of many
- Diversity important: randomness, repulsion
- Embrace risk (expendability) and redundancy
- Agents should be able to share information
- Mix planning with execution

Principles

- Try to avoid functional decomposition
- Simple agents (small, forgetful, local)
- Decentralized control
- System performance from interactions of many
- Diversity important: randomness, repulsion
- Embrace risk (expendability) and redundancy
- Agents should be able to share information
- Mix planning with execution
- Provide an "entropy leak"

Class Discussion

John Schneider on swarms vs. hierchical agents