CS378
Autonomous Multiagent Systems
Spring 2005

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Week 8b: Thursday, March 11th

Good Afternoon, Colleagues

Are there any questions?

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- Granularity vs. lanes
  - How does performance go down with higher granularity
- Why does perf. fluctuate with higher spawning rate?

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- Start on the projects!

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- Any other applications?

Past years' applications

- OASIS
- Archon — an early MAS
- Trafficopter — highway traffic planning
- AntNet — network routing using ant metaphor
  - Competitive results
- Elevator control — using RL

Archon — Cockburn and Jennings ’96

- Large, industrialized systems (e.g. electricity distribution)
- A general system (methodology)
  - many applications
- Clearly distinguish between:
  - **social know-how** (AL)
  - **domain-level problem solving** (IS)
- Built to combine **legacy systems**

Trafficopter — Moukas et al. '98

- Intelligent highways without the infrastructure
- Oncoming cars report upstream traffic
- Cars equipped with PDAs, GPS, wireless transceivers
  - Cheap equipment
  - Cars easily equipped
  - Not needed on all cars

Data Transfer

- Cars query about specific map locations
- Messages propagated by other cars
- Some controls to keep data fresh:
  - Half-time decay function of traffic data
  - Requests die after number of hops, amount of time
  - Farther messages propagates first (hop minimizer)
  - Only 3 propagations per message

Results

- Feasability studies in simulation
- Studied percentage of queries answered as a function of number of cars equipped
- Also studied effect of data cache and hop minimizer

AntNet

- Network routing example
- Randomized algorithm (packets sent probabilistically)
- Travel to destination and back, leaving time-to-dest data at nodes
- Follow the "pheromones" probabilistically

RL for elevator control

- Modeling elevator traffic during lunch
- Huge state space
  - Which call buttons are pressed
  - Which car buttons are pressed
  - Times since buttons pressed
- Small action space
  - Move up/down (when at a floor)
  - Stop/continue (when moving)
  - Some action constraints

Function approximation

- Neural network to approximate Q
- 47 inputs: ("after considerable experimentation")
  - call buttons (18)
  - car location (16)
  - other car locations (10)
  - domain info: at highest-needed floor or longest-waiting passenger (2)
  - bias unit (1)

Peter Stone

Two architectures

- Parallel: all elevators share the same network (homogeneous)
- Decentralized: each elevator has its own network (heterogeneous)

Results

- Both outperform many other standard algorithms
- Why not use it?