CS378
Autonomous Multiagent Systems
Spring 2005

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Week 8b: Thursday, March 10th

Good Afternoon, Colleagues

Are there any questions?

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- Why no turning?
- What if car breaks down? bigger collision?
- What's happened since then?
- What other traffic research
- Car policy
- doesn't slowing down make things worse?
- Why not compare against state of the art lights (w/ sensors)? timed lights?
- What about the overhead?
- How do you transition to this system?
- Are we artificially ignoring colllisions in continuous space?

- Doesn't intersection need to verify cars are honest?

Logistics

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- Start on the projects!

Proposals

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– Have **something** implemented and evaluated

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- What about multiple intersections?
- Any other applications?

Class Discussion

David Rathmann on supply chains

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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

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)

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?