CS 730/730W/830: Intro AI

2 handouts: slides, asst 2 reference

Logics of Action

Event Calculus

Events and fluents are reified:

$$Member(E23, Flyings) \wedge Agent(E23, John) \wedge Happens(E23, I7) \ldots$$

$$T(At(John, KN133), t_1) \wedge Terminates(E23, At(John, KN133), t_2) .$$

Situation Calculus

World state (= situation) is reified:

$$Result(GoForward, s_0) = s_1$$

$$Result(Turn(right), s_1) = s_2$$

$$\forall s, a, b Clear(a, s) \wedge Clear(b, s) \rightarrow On(a, b, Result(PutOn(a, b), s))$$

Problems with Logic

Defaults: hard to have coherent semantics and efficient inference (default logics, probabilistic logic)

Ramification problem: choosing what to infer (specialized systems)

Retraction: when previous truth becomes false (truth maintenance systems)

Qualification problem: making rules correct (probabilistic logic)

Break

- asst 2
- exam 1: Thurs 12:40-2 (common exam time)
- asst 3: domain-independent planner
- final projects: must see me before turning in proposal, due Apr 2

State-space Planning

Types of Problems

- actions serial or parallel
- actions unit time or varying
- actions unit cost or varying
- minimize makespan, cost, combination, or multi-objective
- just logical fluents or metric quantities (eg, resources) too
- off-line or on-line planning
- world controlled or has autonomous (predictable) dynamics
- 'single agent' or other agents modifying state
- actions deterministic or stochastic
- states fully, partially, or not observable
- initial state known or unknown
- single goal state or set
- goals of achievement or maintenance
- action space discrete or continuous
- state space discrete or continuous

plan, conditional plan, policy

Frame Problems

representational: how to represent what doesn't change
inferential: how to compute new state quickly
qualification: how to represent preconditions

STRIPS

Operator schema:

Parameters: Move(block, src, dest)
Preconditions: On(block, src), Clear(block), Clear(dest)
Delete list: On(block, src) Clear(dest)
Add list: On(block, dest) Clear(src)

Assume everything else is static. Closed world assumption.

Invented for Shakey (SRI).

Grocery World

Initial: At(Home), Sells(HWS, Drill), Sells(SM, Milk), Sells(SM, Bananas)

Go (here,there)

Pre: At(here)

Post: At(there), ¬ At(here)

Buy(store,x)

Pre: At(store), Sells(store, x)

Post: Have(s)

Goal: At(Home), Have(Drill), Have(Milk), Have(Bananas)

Progression

Initial state: initial state
Branch on all applicable actions
Applicable: preconditions hold
Effects: delete deletes, add adds
Goal reached when all goal atoms are true.

EOLQs

- What question didn't you get to ask today?
- What's still confusing?
- What would you like to hear more about?

Please write down your most pressing question about AI and put it in the box on your way out.
Thanks!