

Topics in KR: Automated Planning & RAC

- Sensing: active & passive, continuous, discrete
- ND plan:
 - conformant - Always reaches goal regardless
 - contingent - depends (full obs.)
 - noncontingent - (partial obs.)

reasoning
planning
scheduling
NONDET projects

Tradeoff in modeling: NonDET can be converted to partial info

Tradeoff between representability & tractability

- blog
- UTG (theory correct, not more)
- DCS courses
- graph
- UAIG

(vs) ADL

Descr. Language used in KR research
→ more compact than PDDL

PDDL - Planning Domain Descr. Language
(Davis Putnam Logemann Loveland)

(vs) DPLL

LDCDCL (conflict driven clause learning)

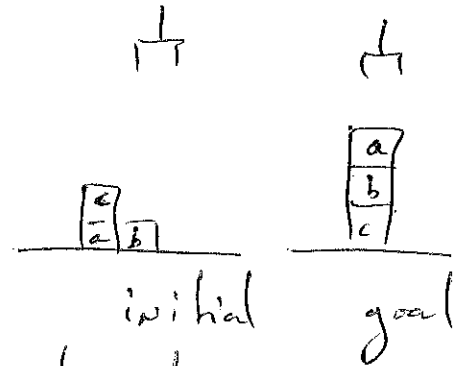
Representa^o

- Classical rep
 - STRIPS (no func^o, actions are relat^o)
- Set theoretic repr
 - SAT-solvers (DPLL) (combinatorial explosion)
- State variable represent^o (Finite Domain Repr)
 - (non-fluents → ground rel^o (properties about obj))
 - (fluents → functions)
- Modern heuristic planners = SAS+ → FD → LAMA...

- gradua^o
- assignment
- BRUNNEN
- page
- Exam issue
- request
- top
- EDUS

The Sussman Anomaly

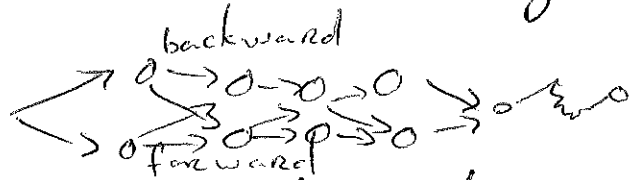
→ Backward Search in STRIPS cannot find optimal sol^o (no redundant/useless move)



Questions for Sheila

• parallel (lifted) search

• sub-symbolic param optimization for model initialisation
 ↳ domain-specificity



interlude: SAT solvers

→ DPLL alg → arbitrary CNF → {sat, unsat}
 backtracking + unit propagation + pure literal elim

↳ simple case of resolu^o
 → if we get to set of clauses w/
 unit clause (1 literal), we
 can remove it and remove
 every clause with it (if) then
 we can remove the literal if
 in every other clause -

↳ pure literal
 is one that appears
 w/ same polarity
 in all clauses.
 We can delete
 all such clauses
 (set literal to True)

Horn clauses

Clause w/ at most 1 ⊕ literal (i.e. $\neg v \vee w \vee x \vee \bar{y}$)

- Horn
- definite clause: exactly 1 ⊕ literal: $w \vee y \rightarrow x$
 - fact: $\neg v \vee w \vee x \vee \bar{y}$ unit clause: x
 - goal clause: only ⊖ literals: $w \vee y \rightarrow F$
- $(\bar{w} \vee \bar{y} \Leftrightarrow \bar{w} \vee \bar{y} \vee F) \rightarrow$

DPLL heuristics
 conflict resolu^o
 (clause learning) VS GSAT heuristics (Walk Sat)
 TABU search

Answer-set programming

repeat local search
 to learn taboo
 areas?

Enforced Hill Climbing

C3/PROBE Planner

- probes - micro-acc built as the fly
- avoid searching! with C3 - backtrackingness

VAISHAK TALK

PREGO paper
 Logic + Prob = ultimate expressiveness
 "and what's in a
 "and some
 forth"
 VERY good generalization

Plan width: appear to characterize hardness / interconnectivity of plan pb

→ graphical models

Lot of notions of width that captures planning pb:
 Nir Lipovetsky

Width of pb / G : size of smallest chain → G of slides

→ It pays off to narrow your way into a plan
 (than search methodically through it)

Temporal extension $S_0 \models S$
 "read" "precedes"

1. translate PDDL w/ common knowledge
2. preprocess
3. search

2009-2011
 FD (LAMA)

1990s	2000s	2002	2008
?	Graph Plan Blackbox SAT	FF	LAMA

2014
 KWAPTK (Lepkat) SOKOBAN!