UCLA Samueli School of Engineering

CS161 WEEK5 DISCUSSION 1C

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Midterm Review

Midterm

TUESDAY

10AM-12PM PST

8PM-10PM PST

Format:

- MC
- True/False
- Question Answer
- Lisp coding

Midterm

COVERAGE

Tree-searching algorithms

- Uninformed: DFS, BFS, Uniform-cost search,
- Informed: A*
- Evaluation

Two-player

- Minimax
- Alpha-beta pruning

Propositional logic

- Format conversion
- Inference
  - Truth tables
  - Resolution

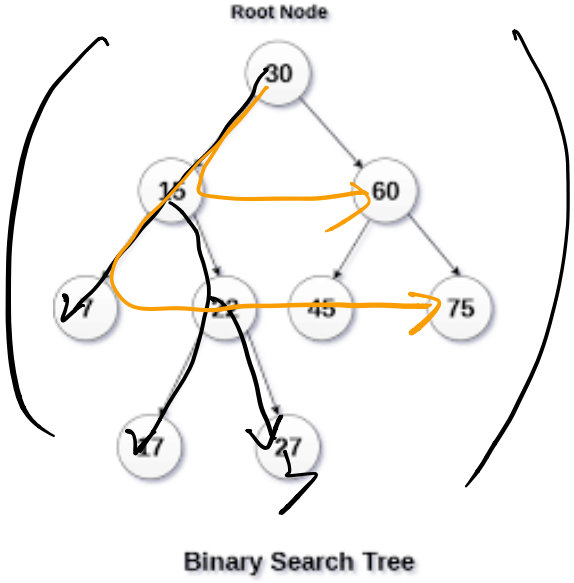
Tree-searching Algorithms

BFS: Expands the shallowest nodes first

DFS: Expands the deepest nodes first

Iterative deepening: iteratively call DFS with incremental depth

Uniform-cost search: Expands the nodes with lowest cost

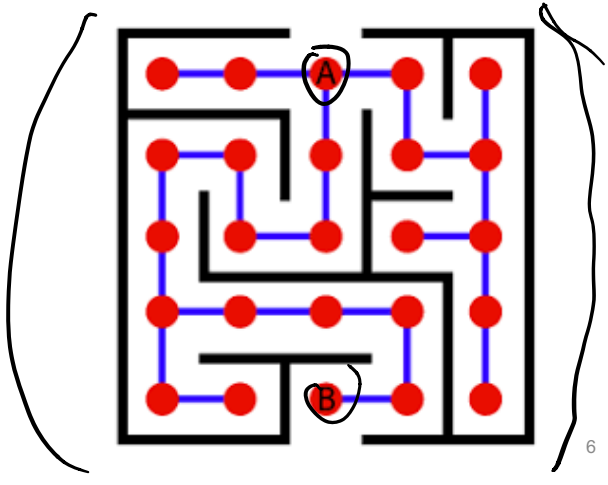


Tree Search Algorithms

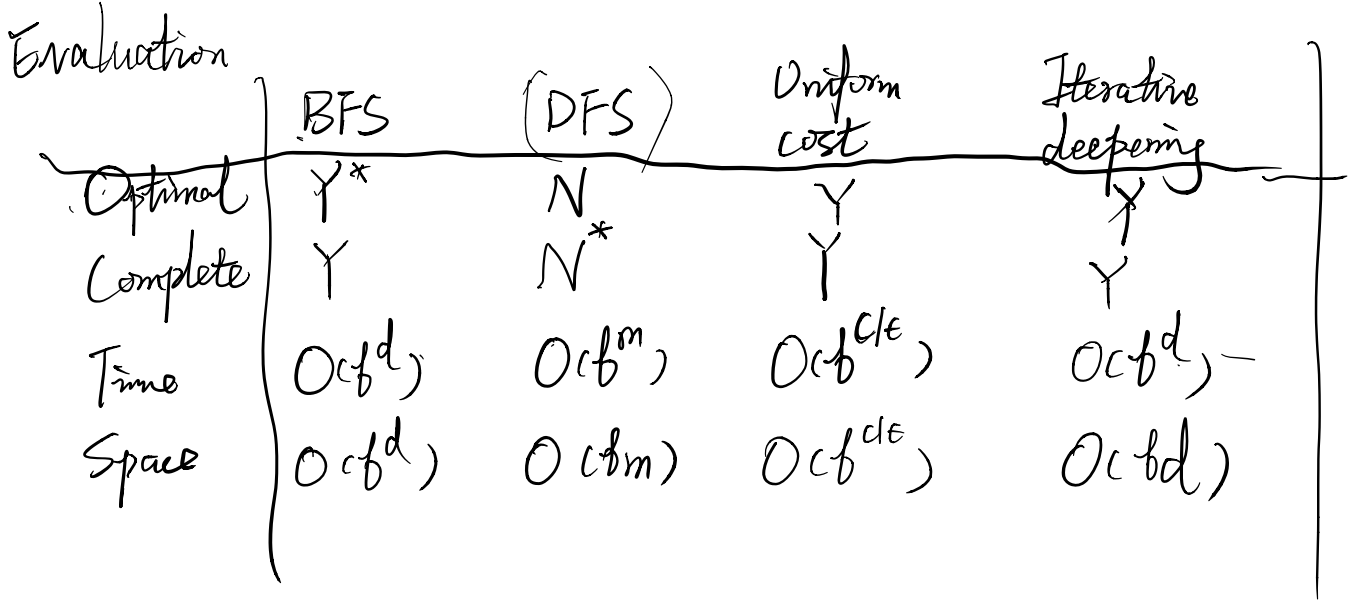
A* Search: Expands nodes with minimum h(n) + g(n)

- **Heuristics**
  - Admissible/Consistent
  - Be able to name some possible heuristics

Manhattan
Diagonal
...



Tree Search Algorithms



Two-player

ALPHA-BETA PRUNING

Alpha: maximum lower bound of possible solutions

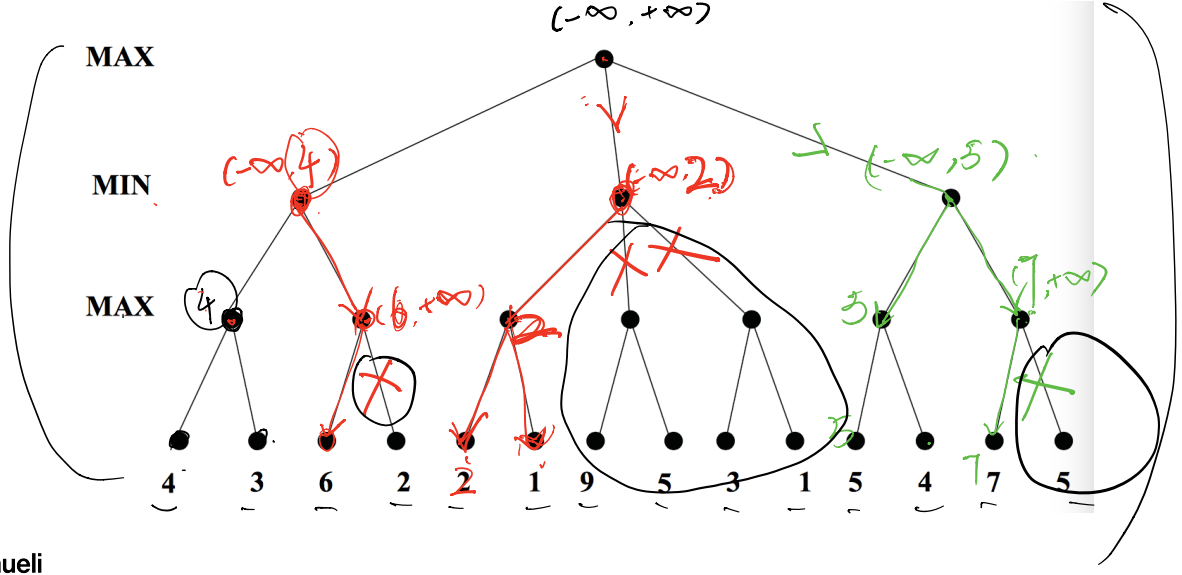
Beta: minimum upper bound of possible solutions

For min: if children's alpha >= parent's beta, prune

For max: if children's beta <= parent's alpha, prune

Two-player

ALPHA-BETA PRUNING



Propositional Logic

CONVERT TO CNF

$(\neg A \Rightarrow \neg B) \vee C) \wedge (\neg C \Leftrightarrow D)$

- $(\neg \quad \Rightarrow \neg \quad \vee \quad)$
- $(\neg \quad \Leftrightarrow \quad)$

$(\neg A \Rightarrow (\neg B \vee C))$

$(\neg C \Leftrightarrow D)$

① $\Leftrightarrow$

② $\Rightarrow$

③ ⋮

$\neg A \Rightarrow (\neg B \vee C)$

$A \vee (\neg B \vee C)$

$A \vee \neg B \vee C$

$(\neg C \Leftrightarrow D)$

$(\neg C \Rightarrow D) \wedge (D \Rightarrow \neg C)$

$(C \vee D) \wedge (\neg D \vee \neg C)$

Propositional Logic

INFERENCE

Knowledge Base

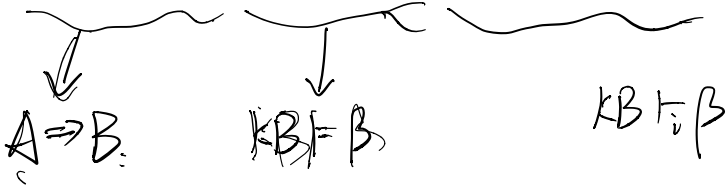
- A set of sentences
- Entailment: KB $\models \beta$ iff for every model in which KB is True β is also True

Inference: derive a sentence from KB

- Sound: correct in all cases
- Complete: we can drive β from KB using rule i

Propositional Logic

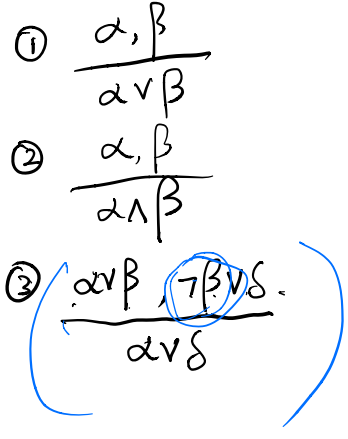
Can you distinguish implication(⇒), entailment(|=), and inference(⊢) ?



Propositional Logic

DFS for all models

Inference Rules



Propositional Logic

RESOLUTION+REFUTATION

Proof KB ∧ ¬α unsatisfiable

Example:

We have a KB: {A ∨ ¬B → C; C →(D ∨ ¬E); E ∨ D}

We have α: A→D

① Convert everything to CNF

A∨¬B→C : ¬(A∨¬B)∨C

(¬A∧B)∨C

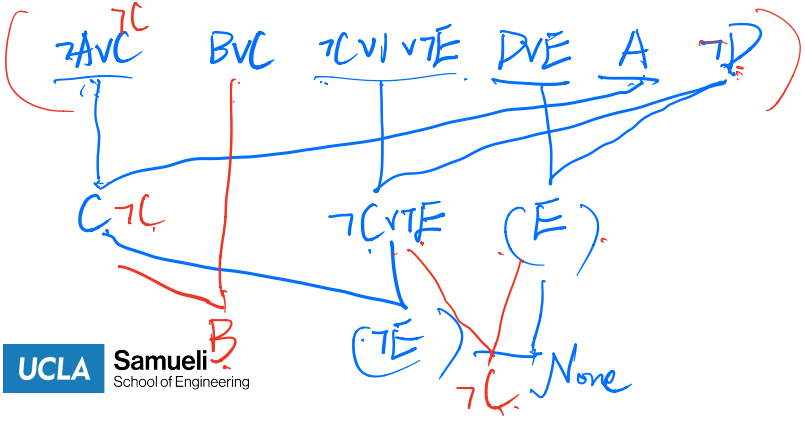
(¬A∨C)∧(B∨C)

C→(D∨¬E): ¬C∨D∨¬E

¬C∨D∨¬E

¬α : ¬(¬A∨D)

A∧¬D



KB ⊨ α

Proved

LISP

- Look back the previous homeworks
- Familiar with car, cdr, cons, list and recursion

Q&A