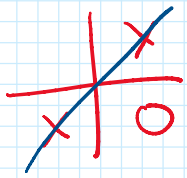
CS 173 Lecture 21b: State-Space Search

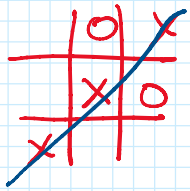
State Diagrams can model games/puzzles

Q: Can we reach a desired outcome ("state") from the starting state?

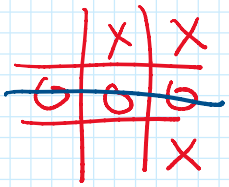
ex. 2×2 tic-tac-toe



2×2



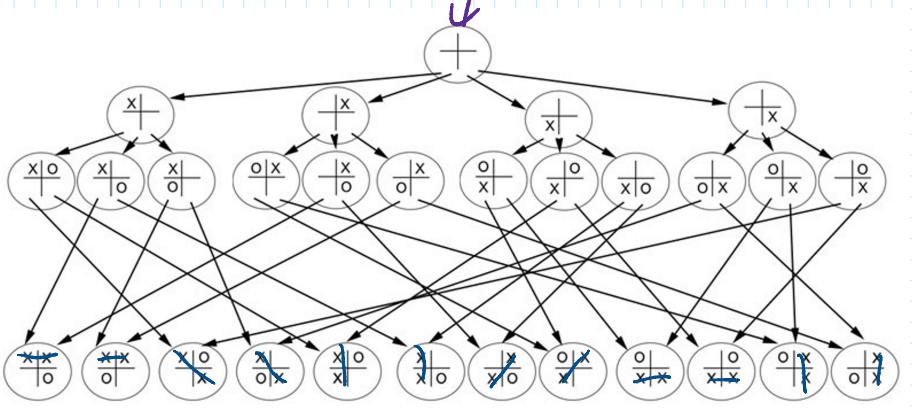
3×3



3×3

Q: Can player O win 2×2 tic-tac-toe?

starting state



In all possible states after X's second turn, player X has won.

→ No, player O cannot win.

Theorem: Given a (directed) graph $G = (V, E)$, a starting vertex s, and a set of target vertices $T \subseteq V$, can determine if can reach a vertex $t \in T$ from s in time $O(|V| + |E|)$

(Ch 15 Connected Components)

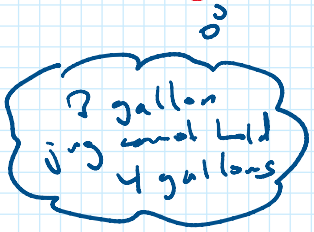
ex. jug game:

two jugs 3 gal & 5 gal

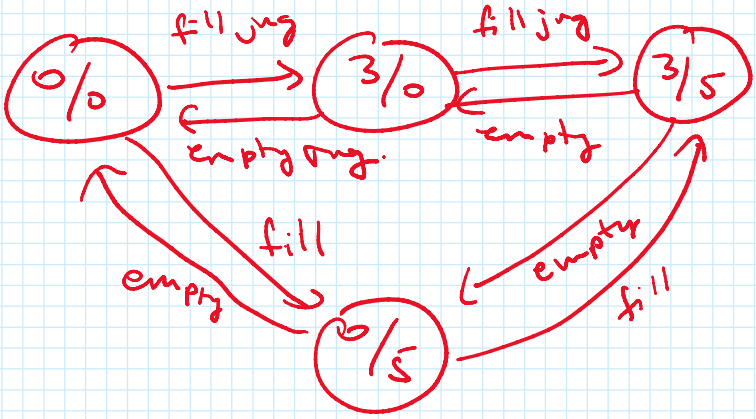
Q: can we measure 4 gallons using these two?

states (x/y) 3 gal jug holds x gallons
5 gal jug holds y gallons.

goal states (x/4)

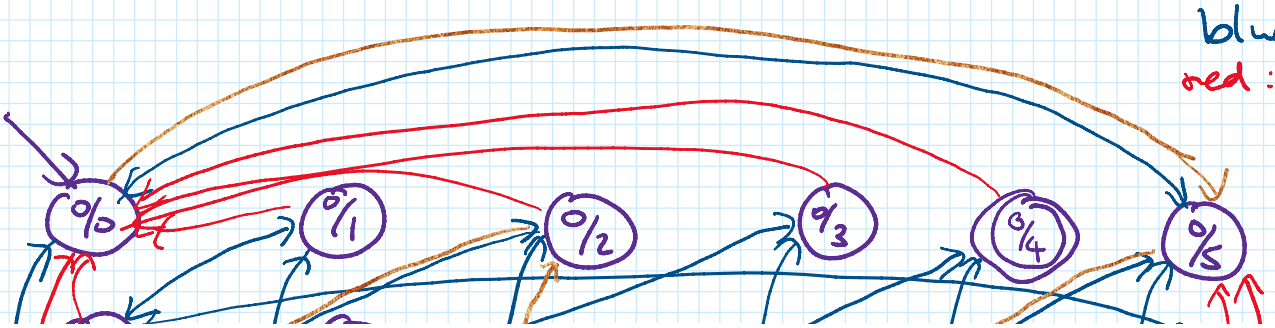


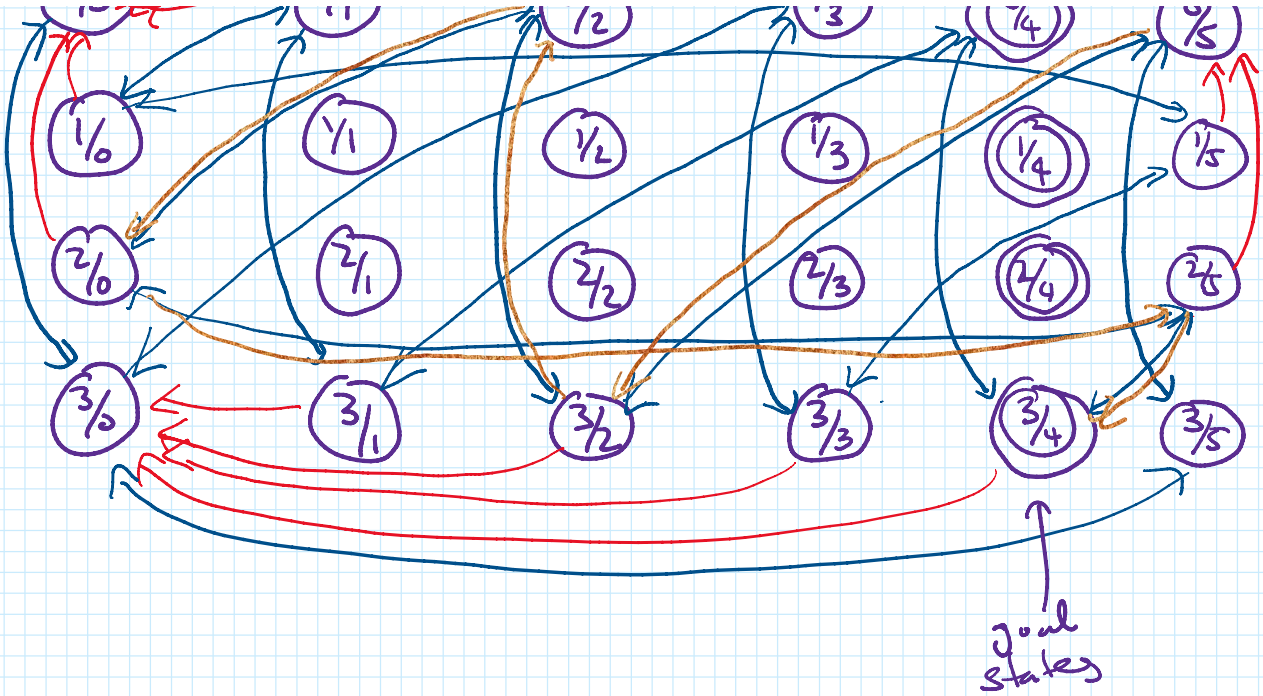
example transitions



all possible states
and some possible transitions

blue: 2-way
red: 1-way

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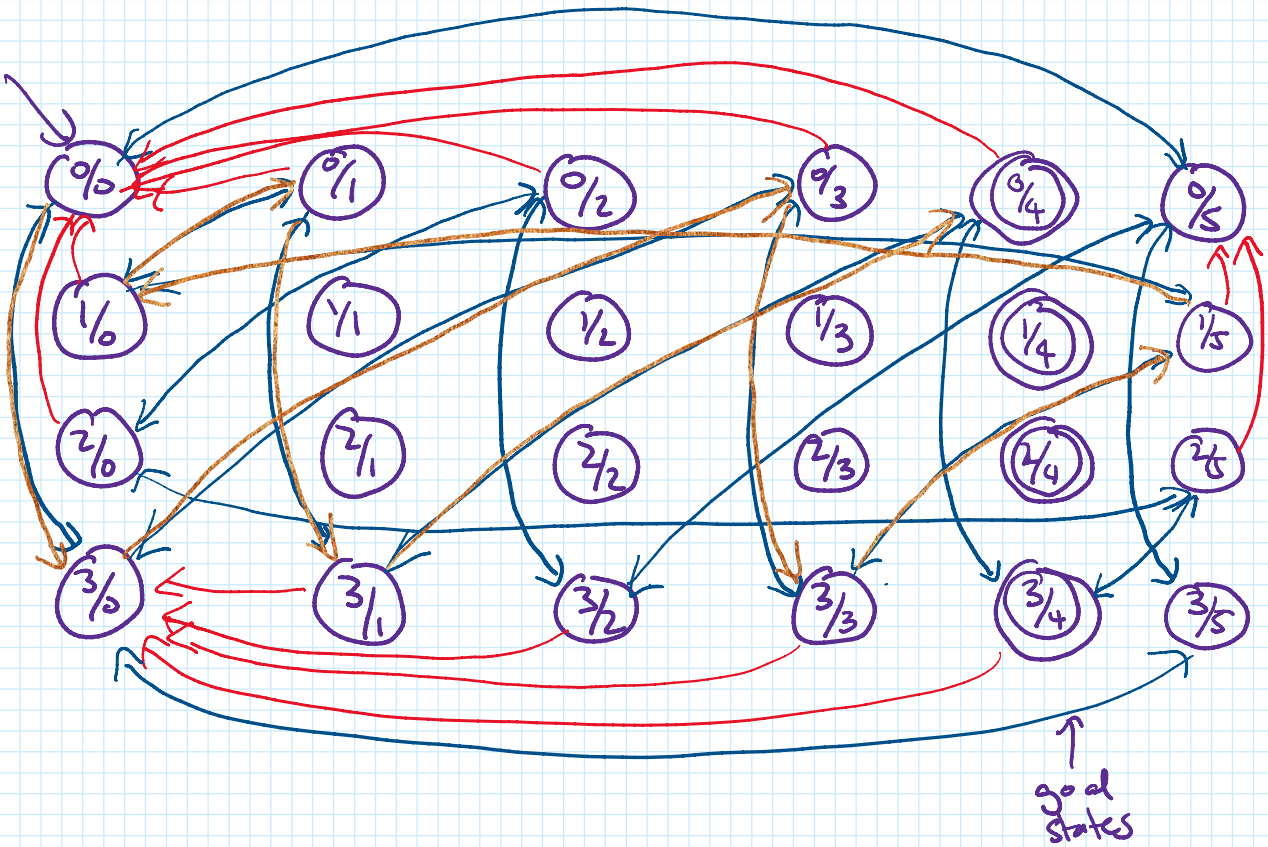
goal states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goal states