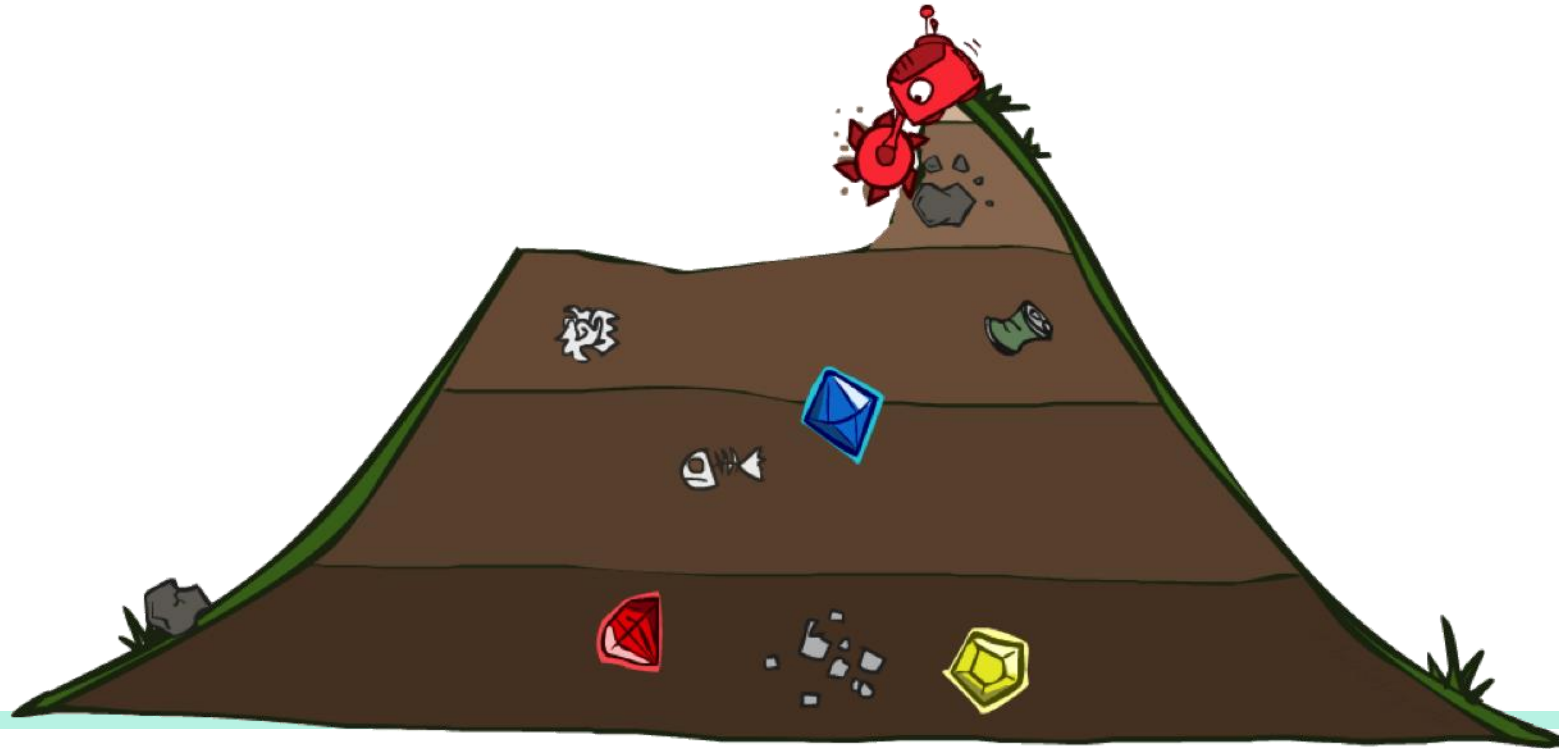


Advanced Topics in AI

Uniform Cost Search



Instructor: Prof. Dr. techn. Wolfgang Nejdl

Leibniz University Hannover

[These slides were created by Dan Klein and Pieter Abbeel for CS188 Intro to AI at UC Berkeley. All CS188 materials are available at <http://ai.berkeley.edu>.]

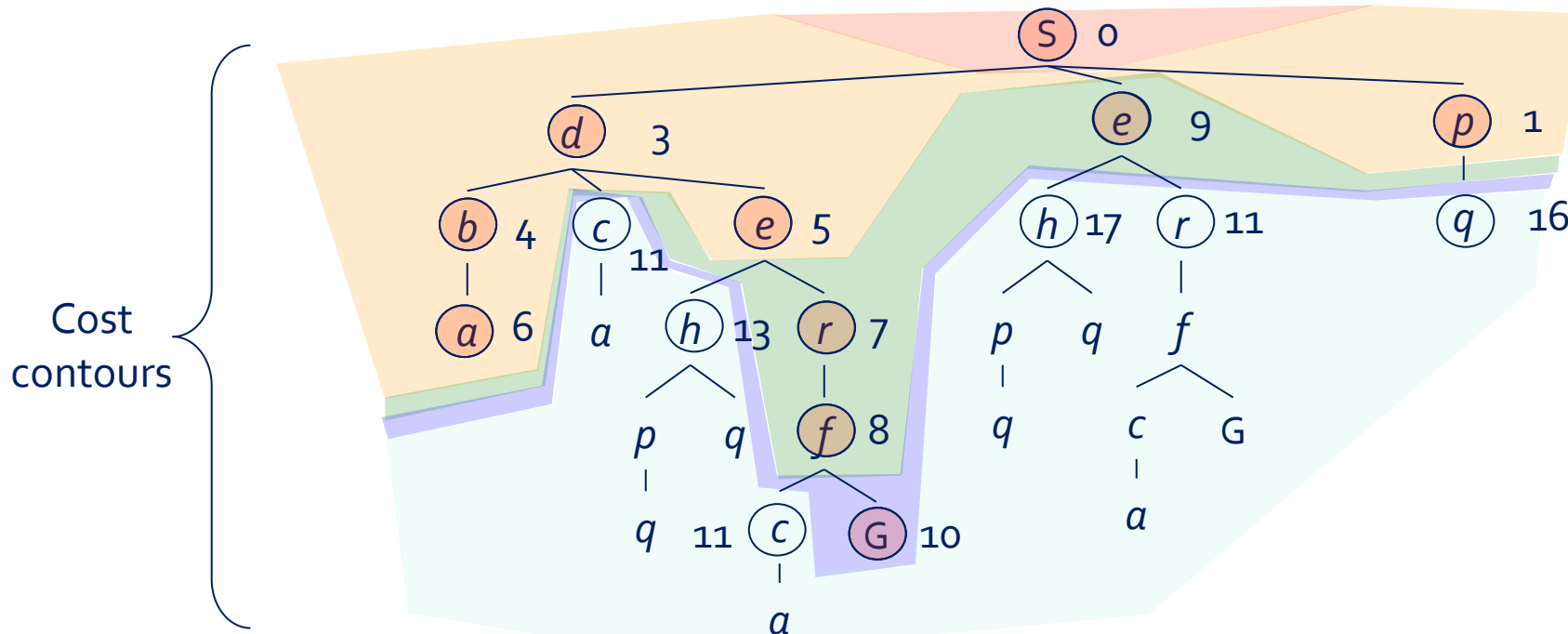
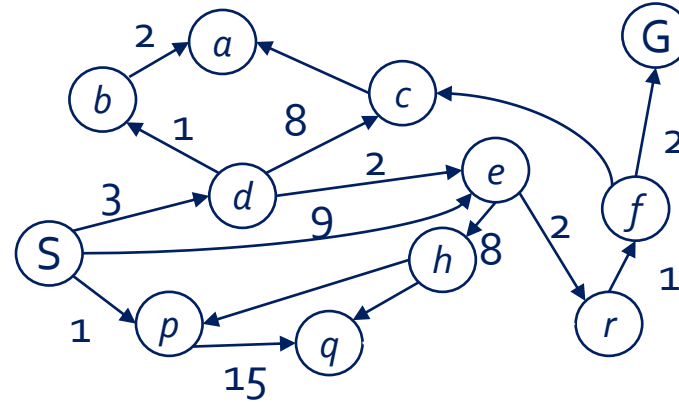


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Uniform Cost Search

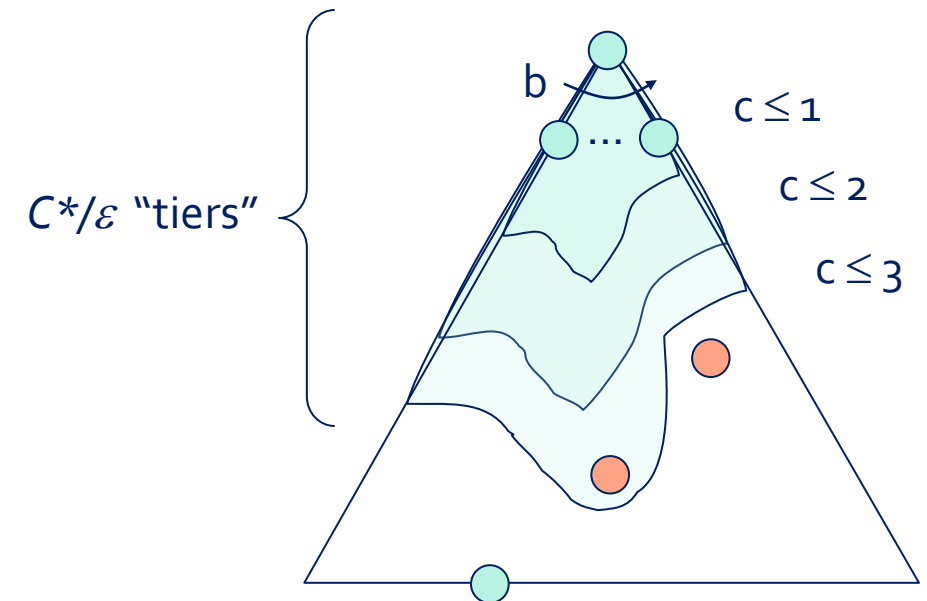
Strategy: expand a cheapest node first:

Fringe is a priority queue
(priority: cumulative cost)



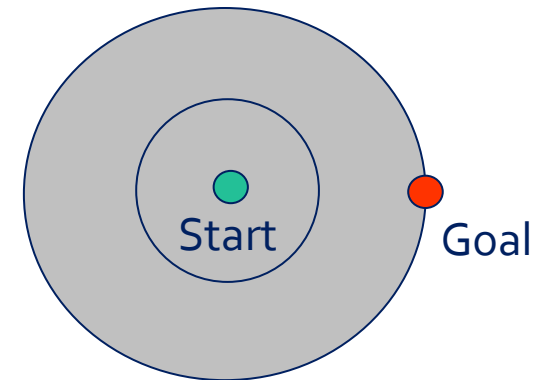
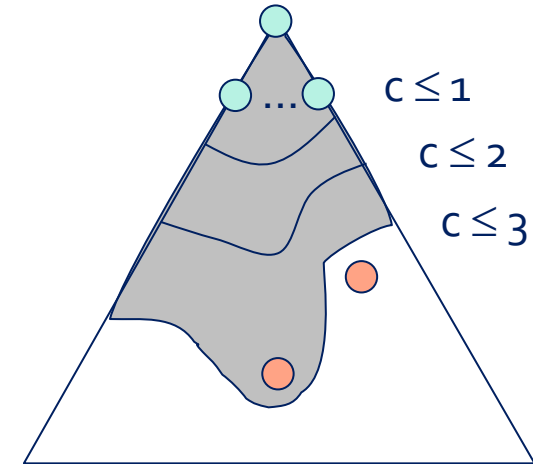
Uniform Cost Search (UCS) Properties

- What nodes does UCS expand?
 - Processes all nodes with cost less than cheapest solution!
 - If that solution costs C^* and arcs cost at least ε , then the “effective depth” is roughly C^*/ε
 - Takes time $O(b^{C^*/\varepsilon})$ (exponential in effective depth)
- How much space does the fringe take?
 - Has roughly the last tier, so $O(b^{C^*/\varepsilon})$
- Is it complete?
 - Assuming best solution has a finite cost and minimum arc cost is positive, yes!
- Is it optimal?
 - Yes! (Proof via A* later)



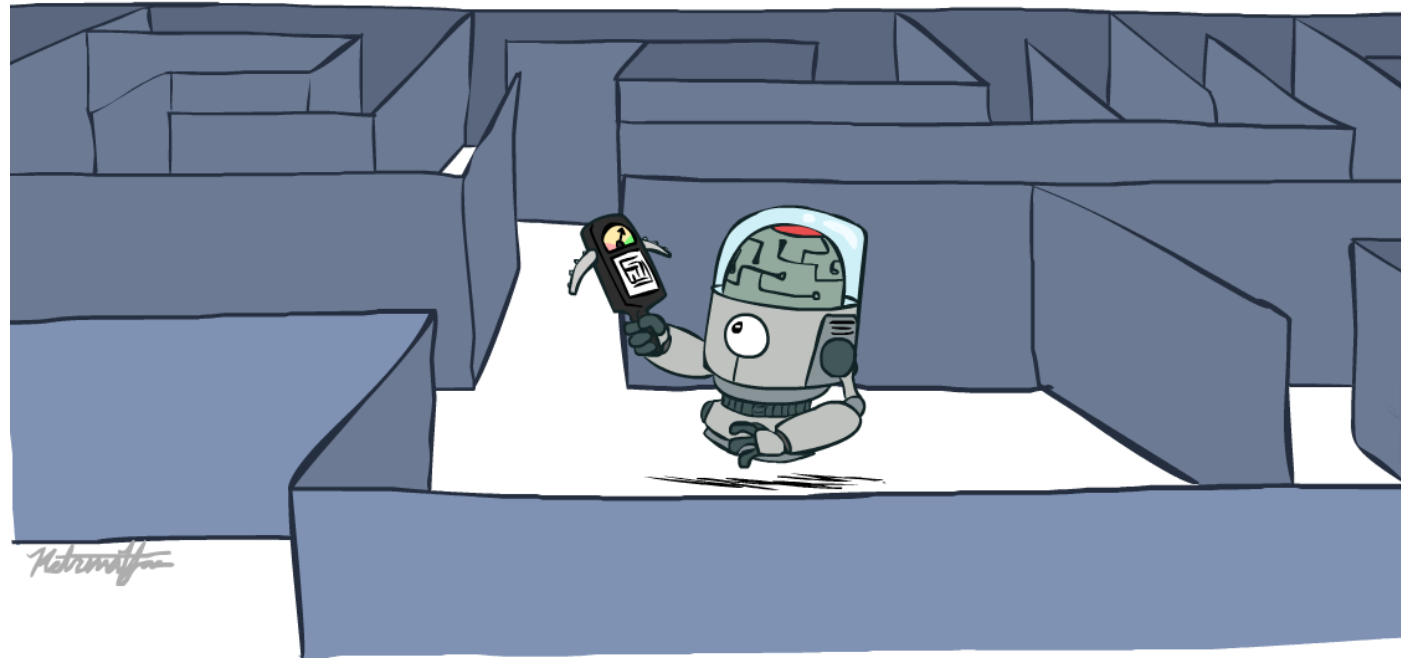
Uniform Cost Issues

- Remember: UCS explores increasing cost contours
- The good: UCS is complete and optimal!
- The bad:
 - Explores options in every “direction”
 - No information about goal location
- We’ll fix that soon!



Advanced Topics in AI

Next: Informed Search



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