Search: recap

Modeling: Transportation example

Example: transportation

Street with blocks numbered 1 to n.

Walking from s to $s+1$ takes 1 minute.

Taking a magic tram from s to $2s$ takes 2 minutes.

How to travel from 1 to n in the least time?

Inference

Algorithms

Tree Search

Dynamic Programming

Uniform Cost Search

Programming and Correctness of UCS

A*

A* Relaxations

Dynamic programming

Key idea: state

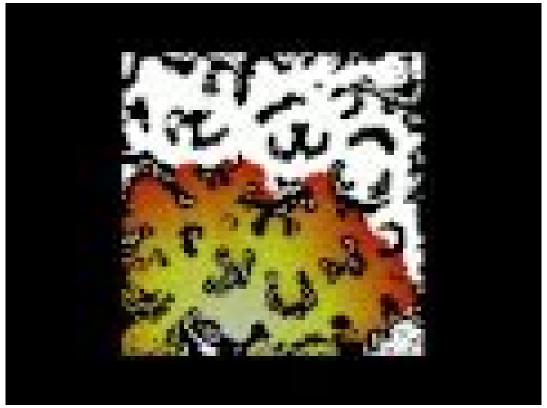
A **state** is a summary of all the past actions sufficient to choose future actions **optimally**.

past actions (all cities)	1 3 4 6
state (current city)	1 3 4 6

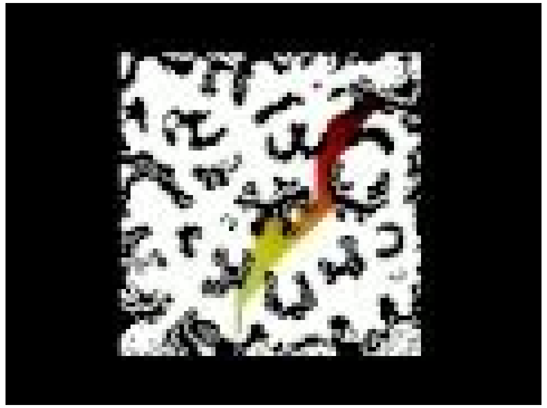
A* algorithm

Add in heuristic estimate of future costs.

UCS in action:



A* in action:



How do we get good heuristics? Just relax...

Relaxation (breaking the rules)

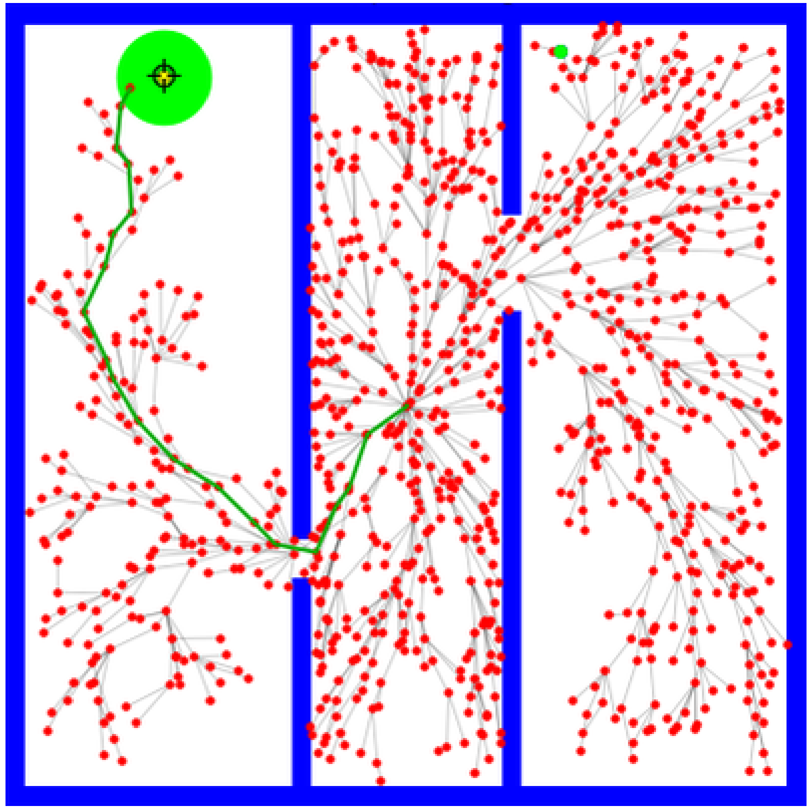
A framework for producing consistent heuristics.

Key idea: relaxation

Constraints make life hard. Get rid of them.

But this is just for the heuristic!

Outlook: Sampling Based Planning Algorithms



Probabilistic Roadmaps (PRM) and Rapidly exploring Random Trees (RRT)

Next time: MDPs

When actions have unknown consequences...