CS 5811
Sep. 2, 2020
Wednesday (1)

Previous class

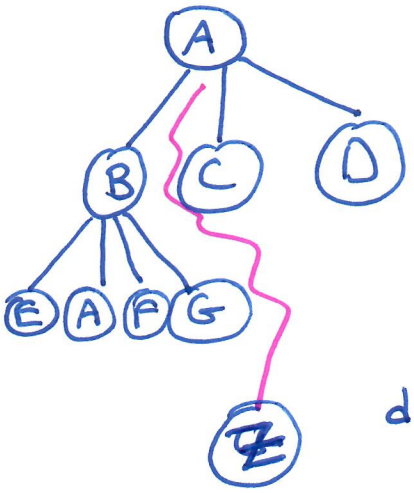
- Search: searching for a solution
  find a sequence of actions that will take the agent from the initial state to the goal state
- Process: initialize a search tree with the initial state as the root
  the nodes of the tree contain the state (an other information)
  expand the tree until ~~we find the goal state~~
- The unexpanded nodes are kept in a list called the frontier.
- Ending question was:
  Should we discard or store the expanded nodes?

The example we are using: Finding a route (path) between two cities. (A map with distances is given.)

This class

- Uninformed search strategies
- Evaluating search strategies

Expanding the search tree



frontier

A — B, C, D

B, C, D — C, D

C, D — E A F G C D

DFS: E A F G C D

BFS: C D E A F G

d — Z = goal

d is not ∞

BFS:

- complete? yes
- time complexity both exponential
- space complexity BFS exponential, DFS

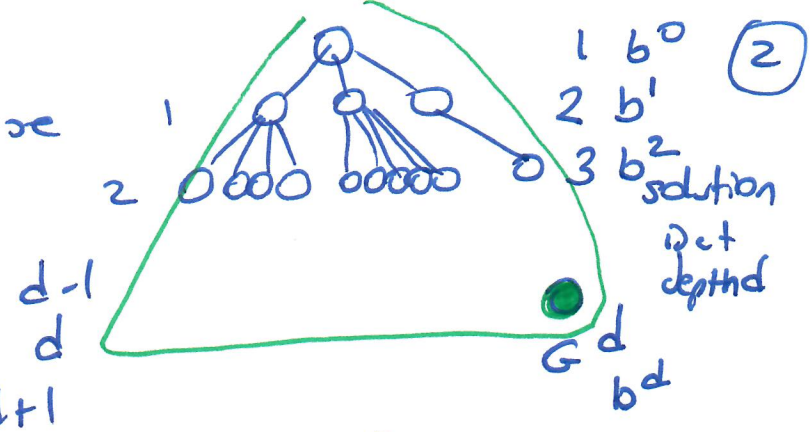
DFS

complete? no (without ~~checking~~ duplicates)

- time complexity

consider the worst case

BFS



(2)

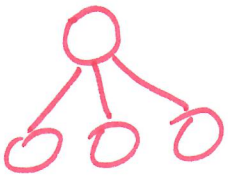
expand

how many nodes will ~~be expanded~~ have been expanded when we find G?

$$1 + b + b^2 + \cdots + b^{(d-1)} + b^d$$

$$O(b^{d-1})$$

$$O(b^d)$$



when is the goal test performed

- when the node is generated
- when the node is expanded

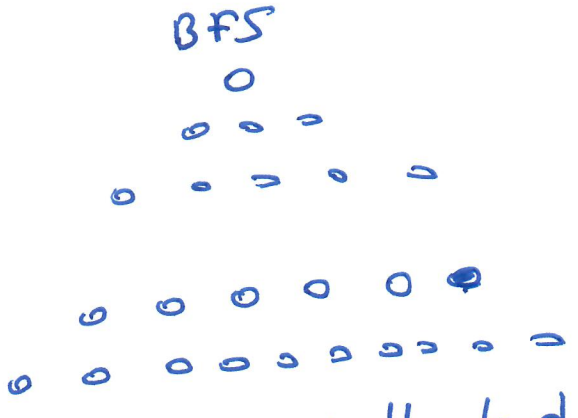
DFS

up to the maximum depth

b^m

$O(b^m)$

BFS



equally bad!

both exponential in the worst case

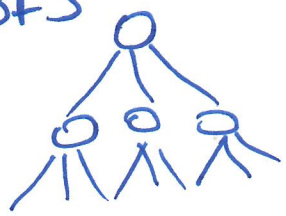
$d = 100$ $m = 150$

$b = 10$ 10^{100} 10^{150}

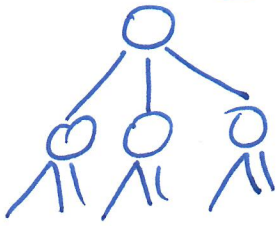
10^{80} subatomic particles in the universe

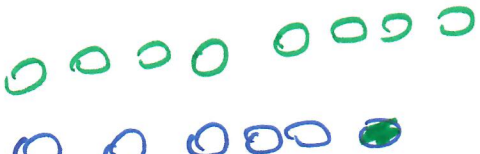
- space complexity
  maximum # of nodes stored
  ↓
  (frontier)

BFS



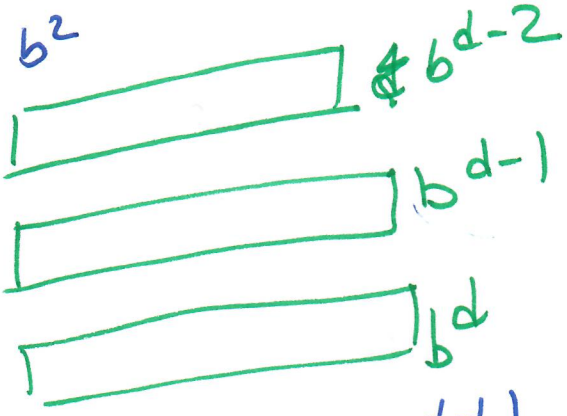
DFS





b

b^2



$O(b^d)$ $O(b^{d-1})$