CS5811
Sep. 4, 2020
Friday (1)

Reminders

- No class on Monday, Sep. 7
  Happy Labor Day!
- We have class on Wednesday and on Friday:
  K-Day recess starts at noon, after our class

Previous class

- Evaluating search strategies

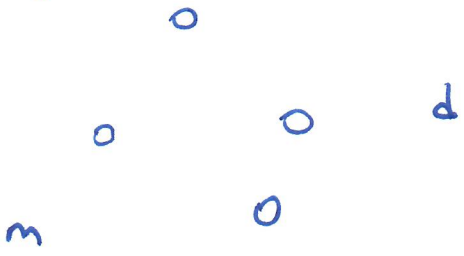
b: branching factor
d: depth of the goal
m: maximum depth of the tree

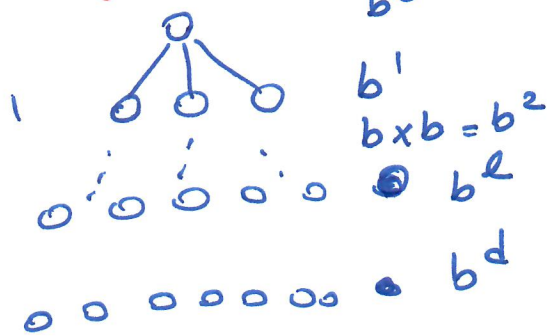
FOR TREE SEARCH	BFS	DFS	IDS
Complete?	Yes ✓	No (2)	Yes
Time complexity (1)	$O(b^d)$ exponential	$O(b^m)$ exponential	exp. w/ repetitions
Space complexity	$O(b^d)$ exponential	$O(bm)$ ✓	$O(bl)$ → level limit
Optimal?	Yes ✓	No	Yes

✓ denotes advantage

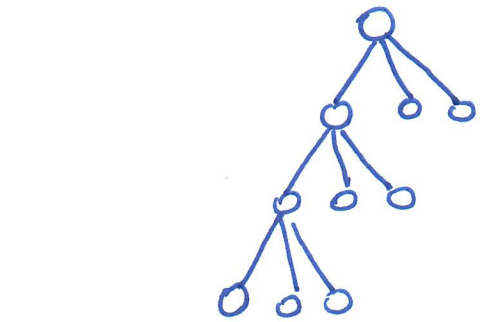
(1) In terms of nodes generated
Apply the goal test when a node is generated.

(2) Can go in loops of visiting the same state.
OR
The state may contain items that can grow indefinitely,
e.g., a plan.





Space complexity of DFS



b 1 ✓

b 2

b ⋮

b m

m

b x m

~~b-1 b~~

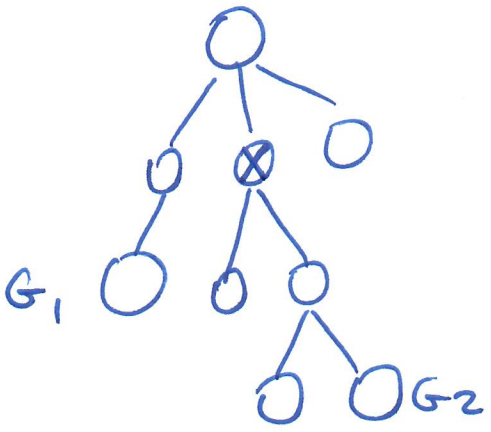
~~b-1 b~~

~~b m~~

cost of a solution is its depth

G_2 suboptimal goal

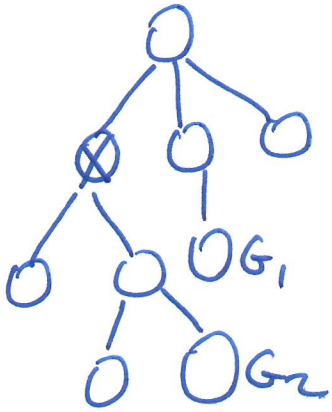
G_1 optimal goal



BFS ✓

DFS ✓

optimal goal will be found



level

1

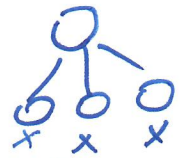
2

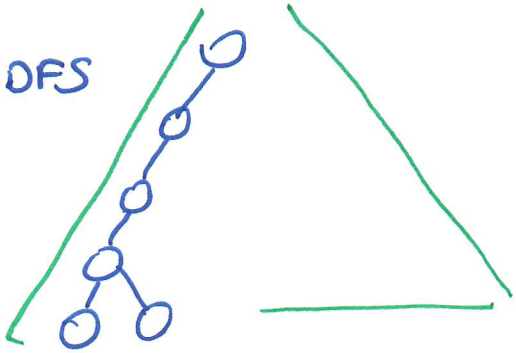
3

BFS ✓

DFS X

Can put a depth limit: 4





depth limit

1 — X 100 X 00 DFS

2 — X

3

start

isn't this the same as BFS?

yes
- expands "level by level"

no
- multiple times (add time) for repetitions

optimal goal is guaranteed by IDS

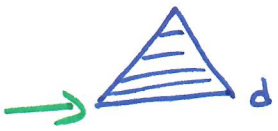
Iterative deepening search

time complexity of IDS

b^{d+1}

$b^d + b^{d-1} + \dots + = O(b^{d+1})$

$O(b^d)$



b^d $\quad e = d$

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

accounts for the repetition

b^d $\quad O(b^d)$