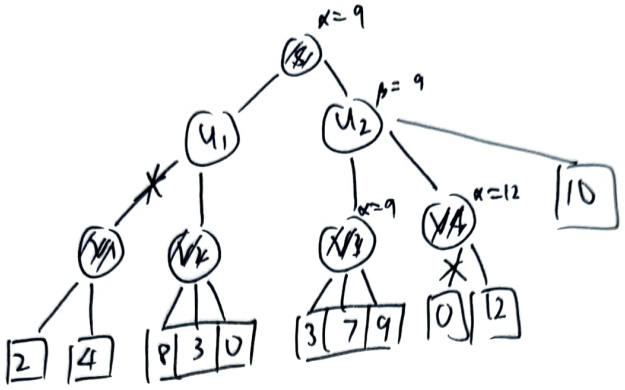
CS3243 Tutorial 6

1. a) iterate over nodes from right to left



$\alpha(s) = -\infty$ $\quad \beta(u_2) = \infty$

MAX node s explores MIN node u_2

MIN node u_2 explores terminal node [10] $\Rightarrow \beta(u_2) = 10$

MIN node u_2 then explores MAX node v_4 $\quad \alpha(v_4) = -\infty$

MAX node v_4 explores terminal node [12] $\Rightarrow \alpha(v_4) = 12$

* stop searching below MAX node v_4 since MIN ancestor u_2 has $\beta(u_2) \leq \alpha(v_4)$

edge between v_4 — [0] is pruned

$\alpha(v_3) = -\infty$

MIN node u_2 then explores MAX node v_3

MAX node v_3 explores terminal node, in order [9], [7], [3] $\Rightarrow \alpha(v_3) = 9$

MIN node u_2 update $\beta(u_2) = 9$

MAX node s update $\alpha(s) = 9$

$\beta(u_1) = \infty$

$\alpha(s) = 9$

MAX node s then explores MIN node u_1 → * value of α pulled down from ancestor s; local $\alpha = 8 \leq 9$; none of terminal nodes $> 9 \Rightarrow \beta(u_1) \leq 9 \leq \alpha(s)$

$\alpha(v_2) = 9$

MIN node u_1 explores MAX node v_2

MAX node v_2 explores terminal nodes in order [8], [3], [0] $\Rightarrow \alpha(v_2) = 9$

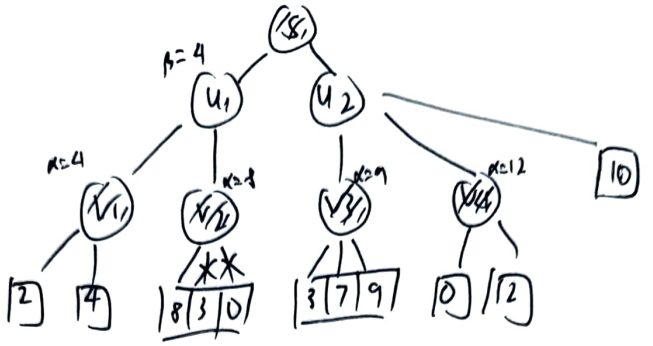
MIN node u_1 updates $\beta(u_1) = 9$

* stop searching below MIN node u_1 since MAX ancestor s has $\alpha(s) \geq \beta(u_1)$

edge between u_1 — v_1 pruned

action returned at MAX node s, i.e. to explore MIN node u_2

b) iterate over nodes from left to right



$\alpha(1) = -\infty$ $\beta(u_1) = \infty$

MAX node S explores MIN node u_1

MIN node u_1 explores MAX node v_1 $\alpha(v_1) = -\infty$

MAX node v_1 explores terminal node in order (2), (4) $\Rightarrow \alpha(v_1) = 4$

MIN node u_1 updates $\beta(u_1) = 4$

MIN node u_1 then explores MAX node v_2 $\alpha(v_2) = -\infty$

MAX node v_2 explores terminal node (8) $\Rightarrow \alpha(v_2) = 8$

* stop searching below MAX node v_2 since MIN ancestor u_1 has $\beta(u_1) \leq \alpha(v_2)$
edge between v_2—3 and v_2—10 pruned

MAX node S updates $\alpha(1) = 4$

MAX node 1 $\alpha(1) = 9$ then explores MIN node u_2 $\beta(u_2) = \infty$

MIN node u_2 explores MAX node v_3 $\alpha(u_2) = 4$

MAX node v_3 explores terminal nodes in order (3), (7), (9) $\Rightarrow \alpha(v_3) = 9$

MIN node u_2 updates $\beta(u_2) = 9$ $\alpha(v_4) = 4$

MIN node u_2 then explores MAX node v_4

MAX node v_4 explores terminal node in order (0), (12) $\Rightarrow \alpha(v_4) = 12$

* stop searching below MAX node v_4 since MIN ancestor u_2 has $\beta(u_2) \leq \alpha(v_4)$
no edges to prune

MIN node u_2 explores terminal node (10), $\beta(u_2)$ still 9

MAX node S updates $\alpha(1) = 9$

action returned at MAX node is to explore MIN node u_2

c) Heuristic order does affect effectiveness of pruning, starting from right to left pruned more of the search tree in this case