

SS
State-space
Search

Game Playing: α - β Search

CSE 415: Introduction to Artificial Intelligence
University of Washington
Spring, 2017

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Alpha-Beta Pruning

Enhance minimax search with two extra values at each tree node that represent the interval in which the "solution" value must lie.
 $[\alpha, \beta]$
 Initialize the root's to $[-\infty, \infty]$.
 Update these at the current node, when possible.
 If any node gets $\alpha \geq \beta$, then it is "finished", so "prune off" any of its children that remain.

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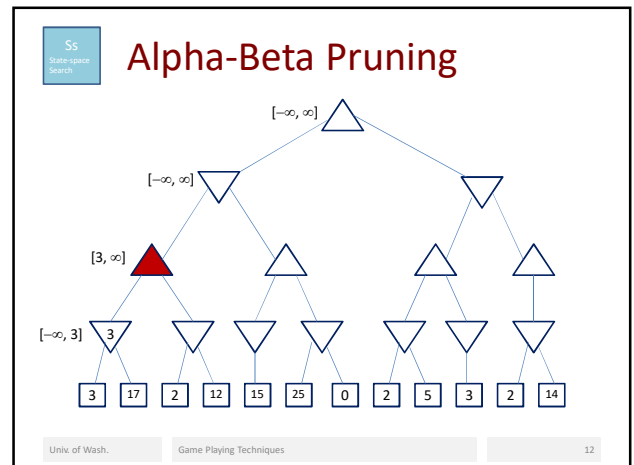
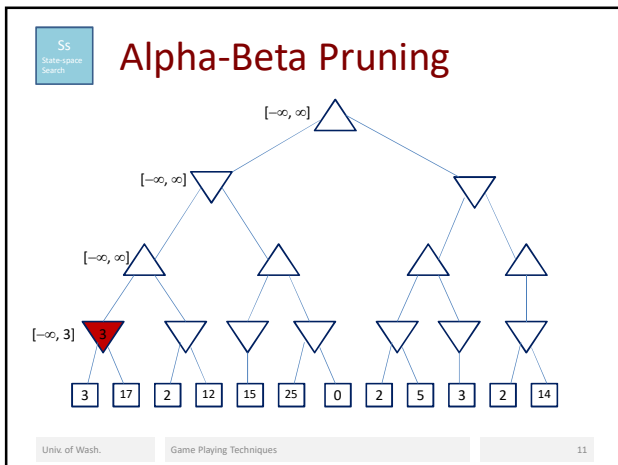
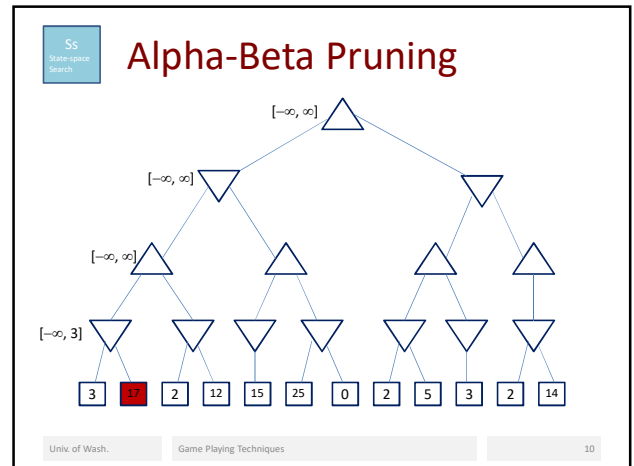
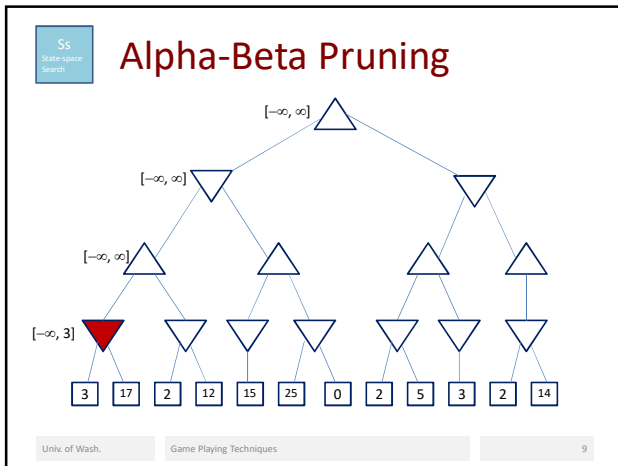
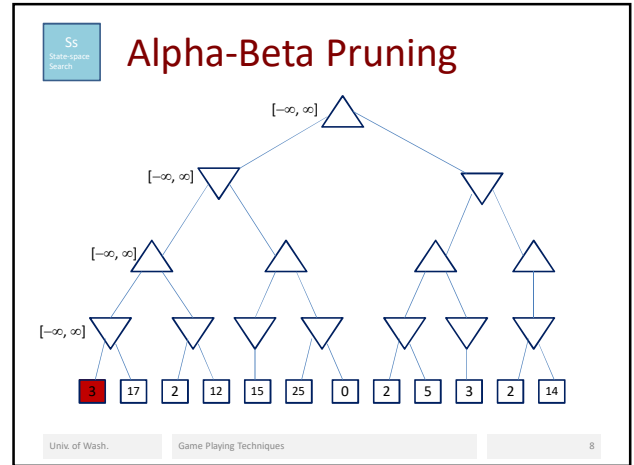
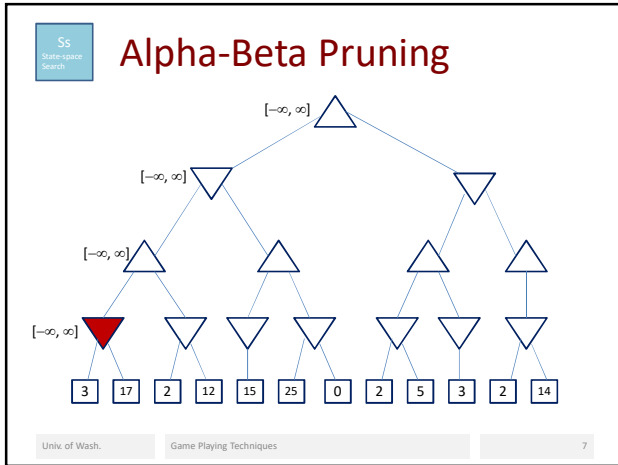
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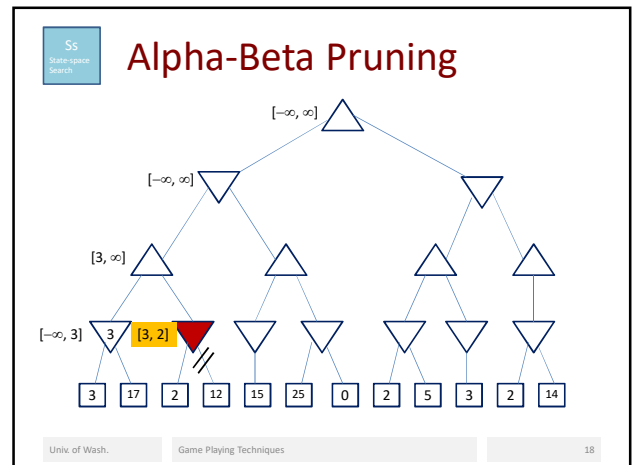
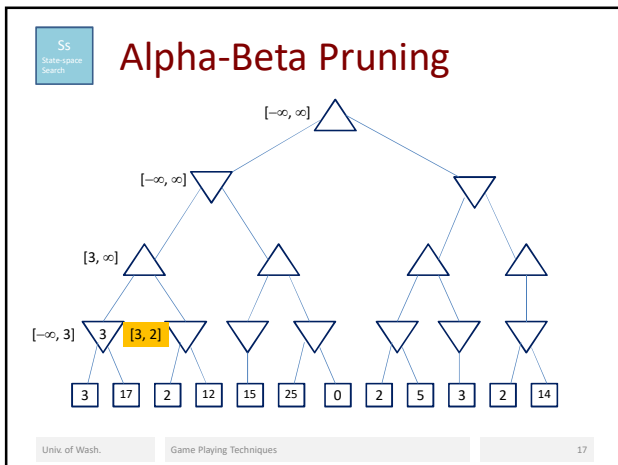
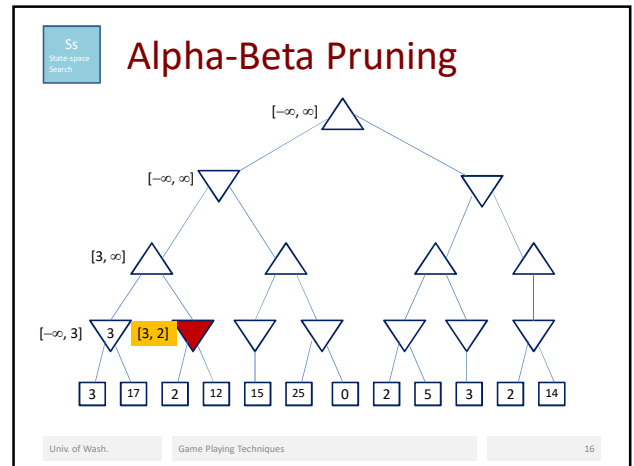
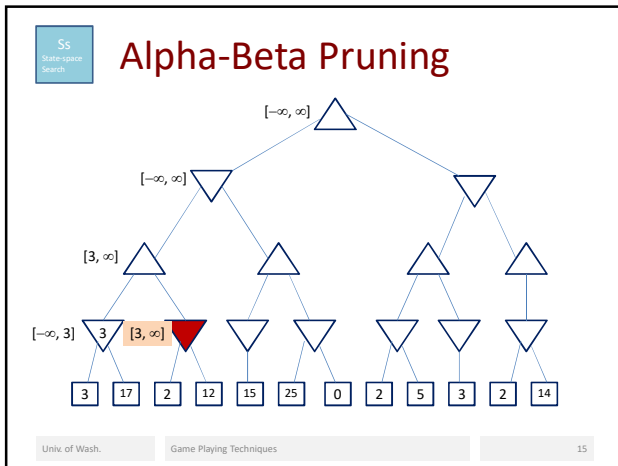
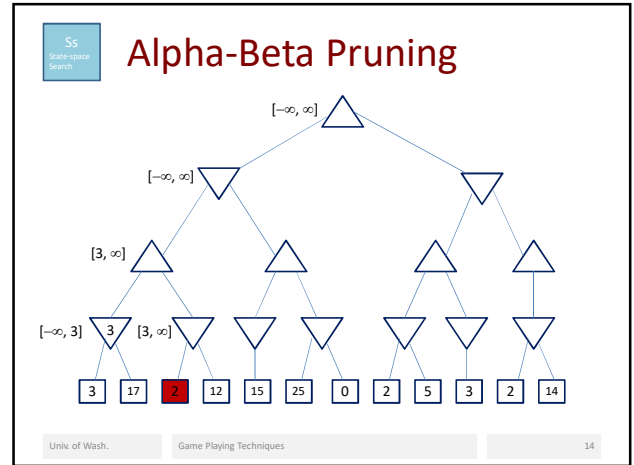
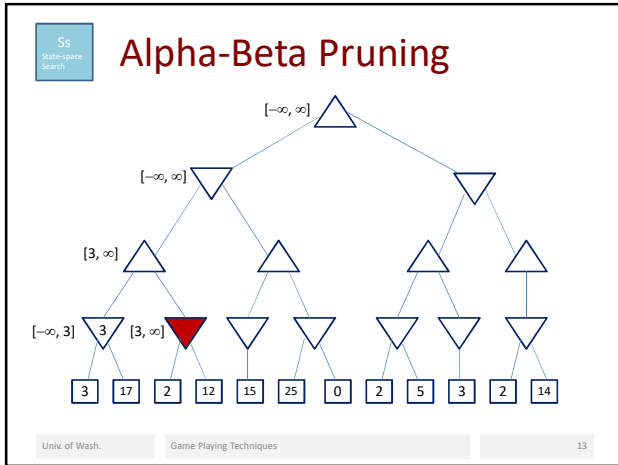
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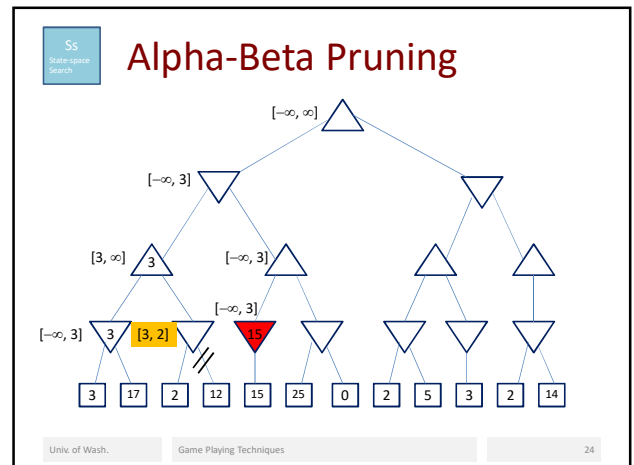
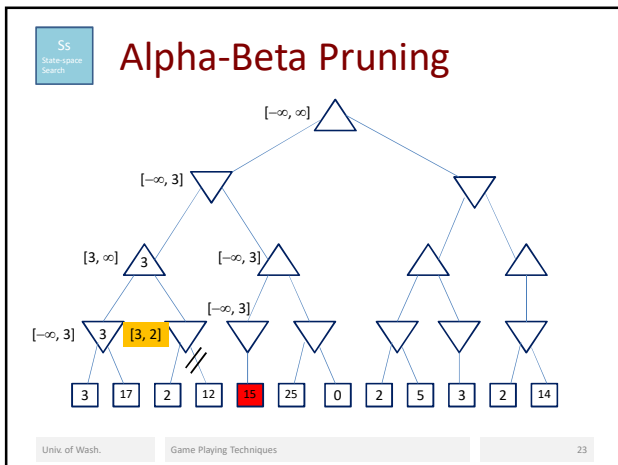
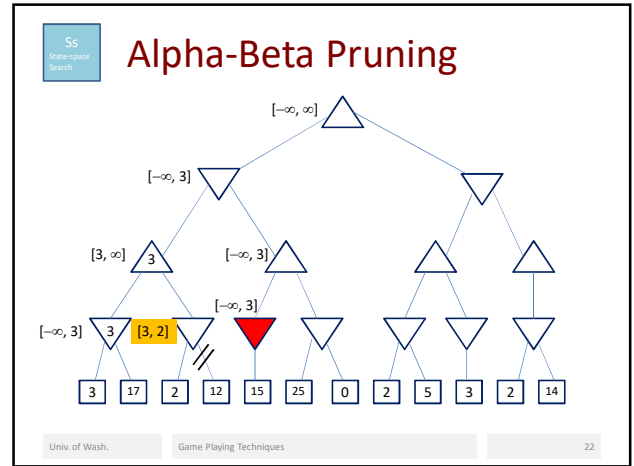
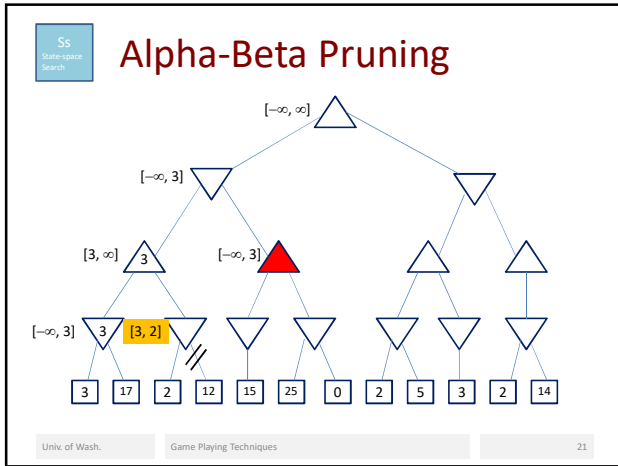
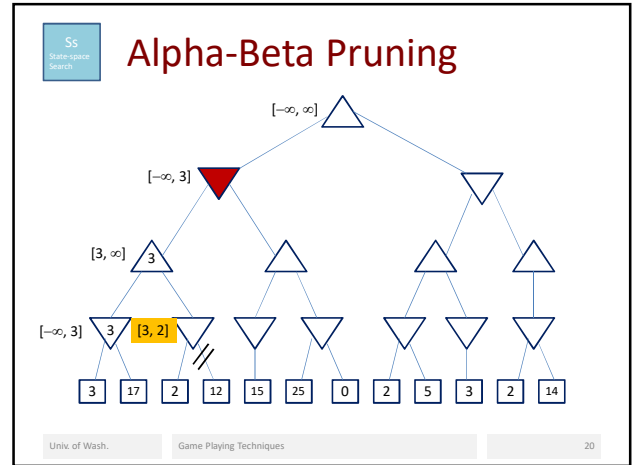
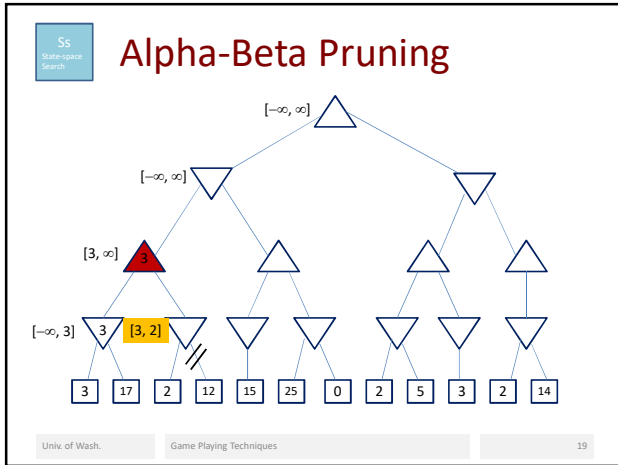
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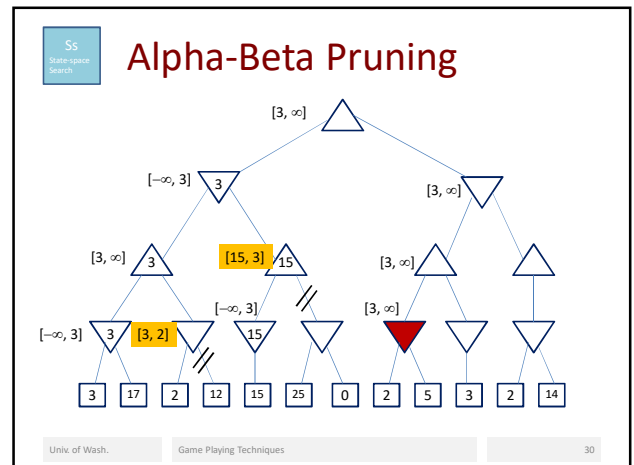
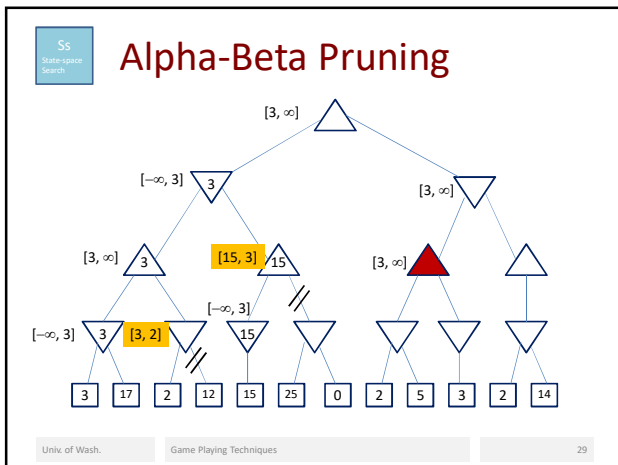
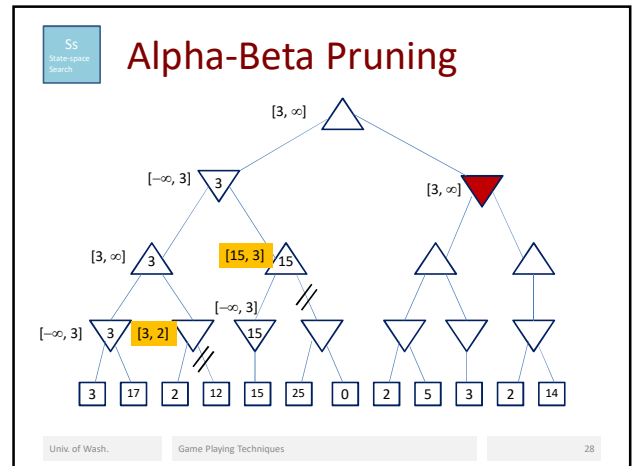
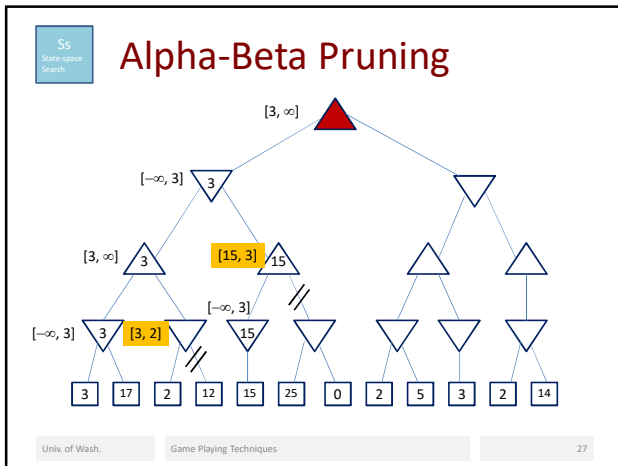
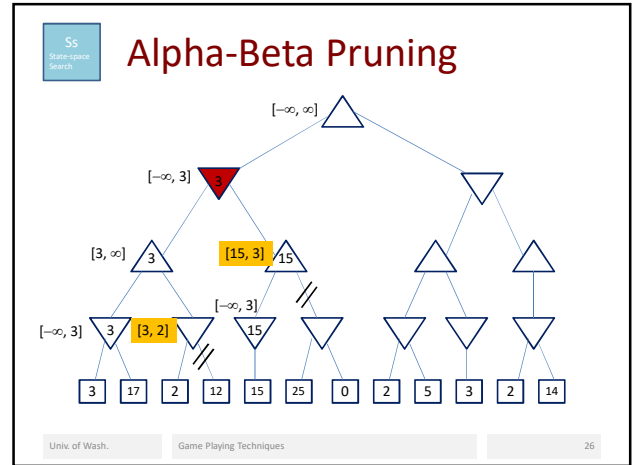
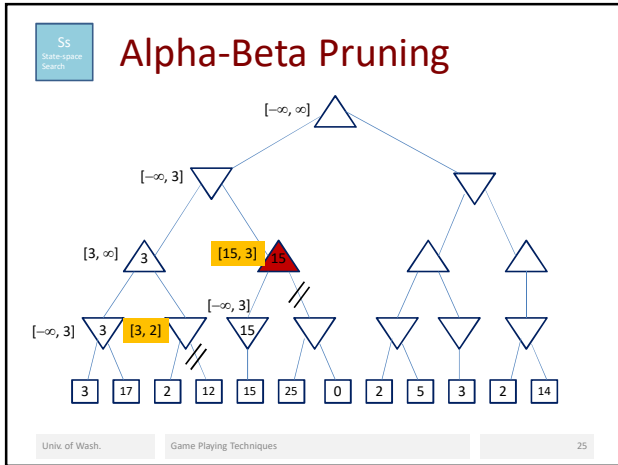
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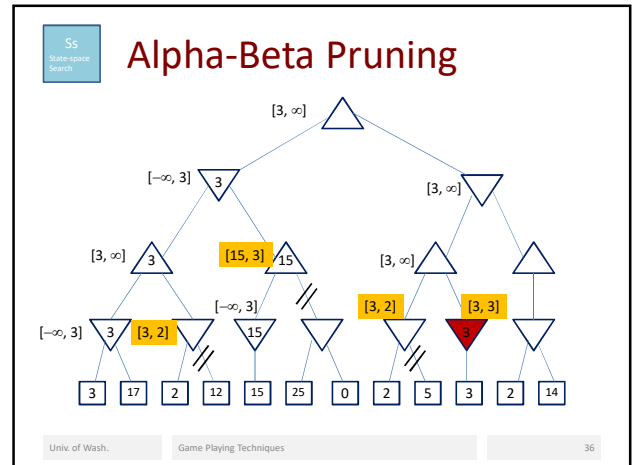
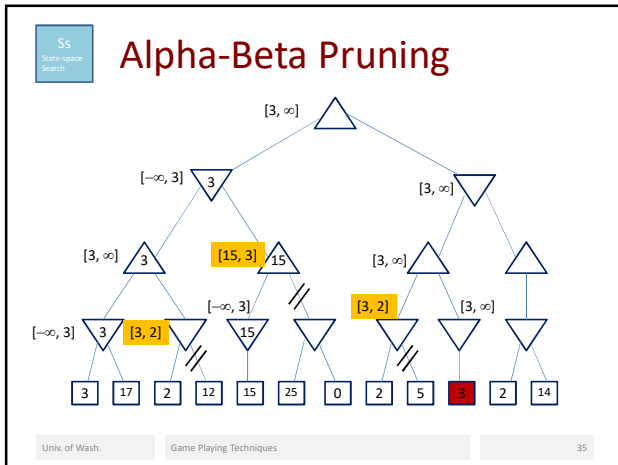
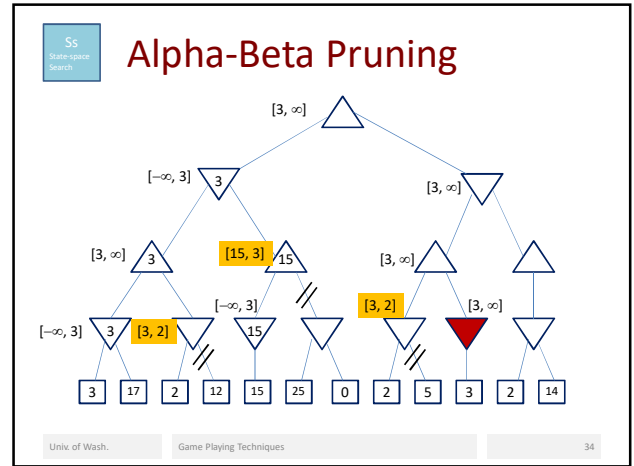
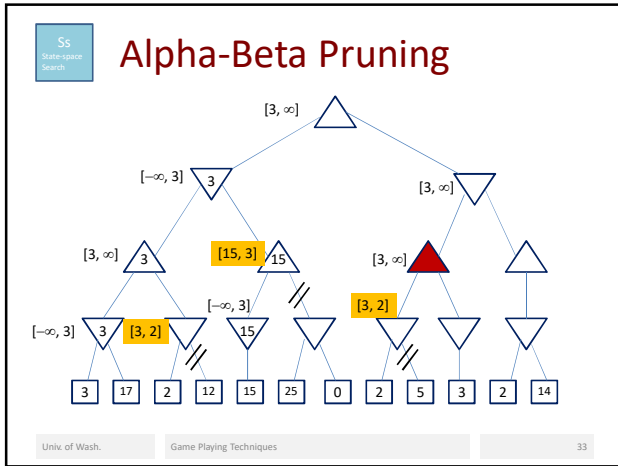
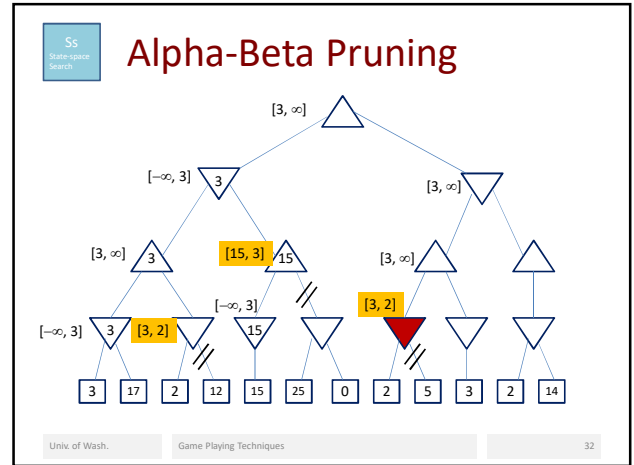
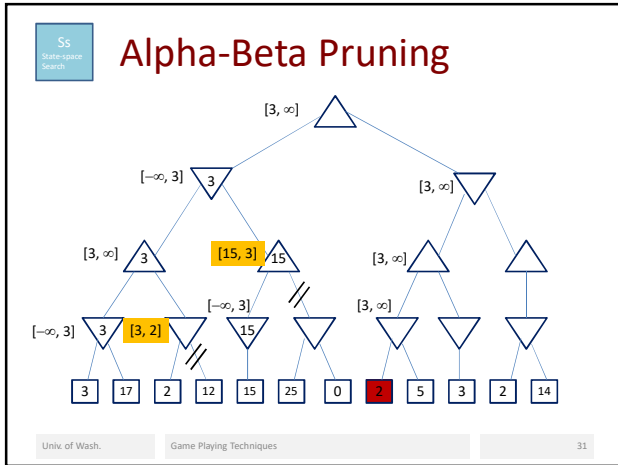
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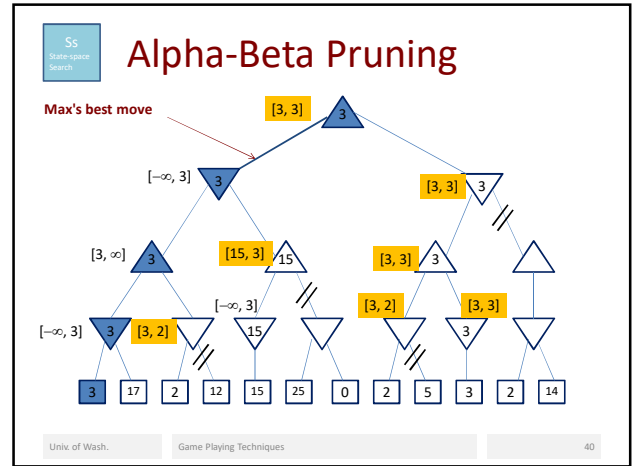
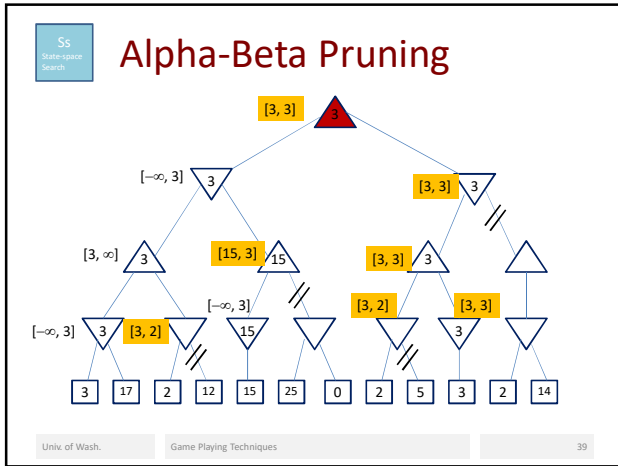
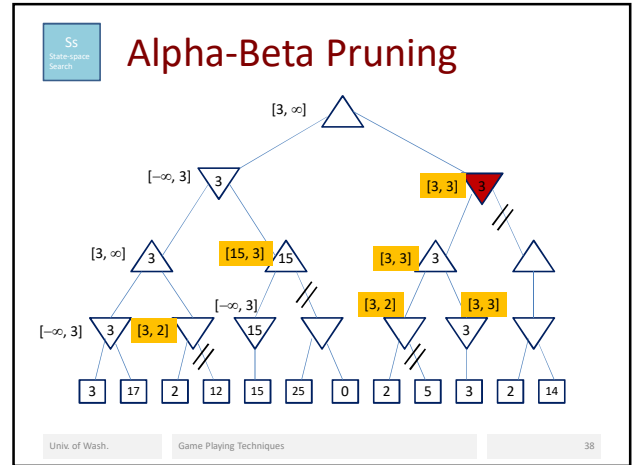
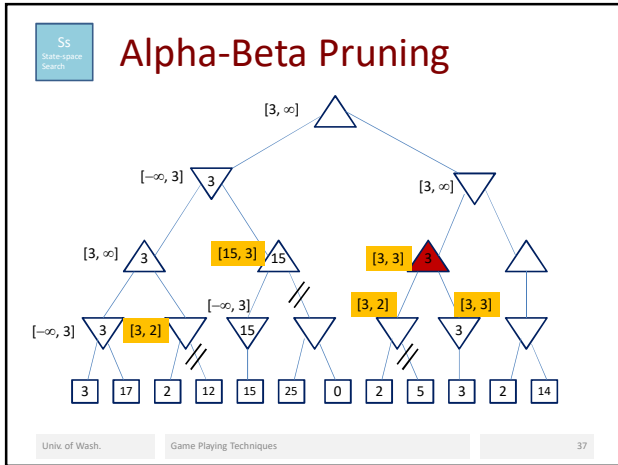












Strategy to Increase the Number of Cutoffs

At each non-leaf level, perform a static evaluation of all successors of a node and order them best-first before doing the recursive calls. If the best move was first, the tendency should be to get cutoffs when exploring the remaining ones.

Or, use **Iterative Deepening**, with ply limits increasing from, say 1 to 15. Use results of the last iteration to order moves in the next iteration.

In games like chess, α - β pruning typically allows searching ahead 2 times as deep. It tends to reduce the effective branching factor from d to approx. \sqrt{d} .

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