Date / / Object Lec 5

Games : is Primarily behavioral, this is how Player's Preceive the intelligence, It's not focused on winning, It enhances Play & enjoyment

*Many similarities To search

Game tree is like search tree
- Node → search state
- edge → moves
- leaf nodes → determined Positions

_at each node it's one or other Player's turn to move

search	Games
_solution is heuristic Metho _Heuristic can Find optimal solution	_solution is strategy (strategy specifies Move for every possible opponent reply)
_Evaluation function : Cost From start to goal	_time limits force an approximate solution
EX- Path Planning , Scheduling activities	EX: chess, checkers ~~chark~~ othello backgammon

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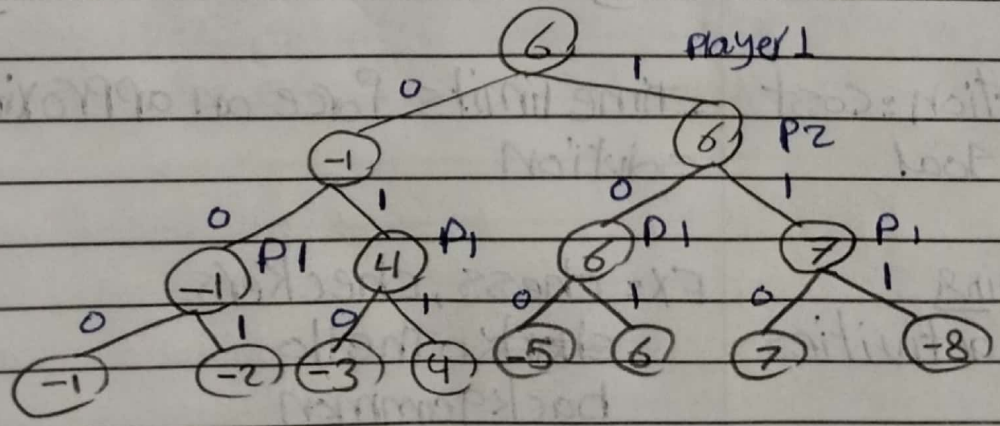
Coping with impossibility :.

1 - usually impossible to solve games completely
2 - we can't search entire game tree
we have to cut off search at a certain depth (like depth bounded depth first, lose completeness)
3 - we have to estimate cost of internal nodes
4 - using evaluation function
- Based on static features

F(n) > 0 → winning in position n
F(n) = 0 → position n is tied
F(n) < 0 → opponent winning

~~Minimizes~~
Min's best strategy :. (MiniMax)
Choose the Move that minimizes the score that will result when Max choose the Maximizing Move



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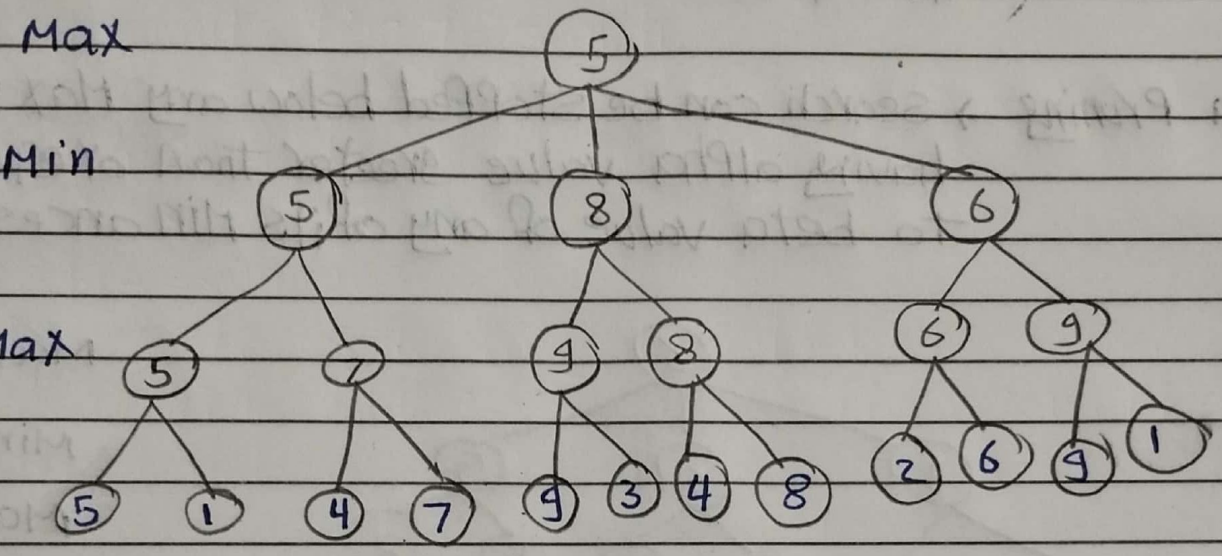
Minimax :. 1- Complete (if tree ~~complete~~ finite)
2- optimal
3- time → $O(b^m)$
4- space → $O(bm)$



Alpha & Beta values :.

① Max node has α value → is lower bound on minimax score
↳ with best Play Max can score at least α

② Min node has β value → is upper bound on minimax score
↳ with best Play Min can score no more than β

* if $\beta = \alpha$ → Min can do as well without letting Max get here so we need not continue

* α can't decrease
β can't increase

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* Alpha Pruning → Search can be stopped below any Min node having a beta value less than or equal to alpha value of any of its Max ancestors.

* Beta Pruning → Search can be stopped below any Max node having alpha value greater than or equal to beta value of any of its Min ancestors

ex: