

Assignment 3 – A hop, skip, and a jump...

Part I: Questions (20 points each)

1. A common strategy in tic-tac-toe is the so-called 3 corners strategy where a player places their symbol in 3 corners leaving two paths to win, e.g.:

x	o	x
o		
		x

How could we use a transposition table to reduce the search space in a case like this?

Transposition tables are used for move ordering. By selecting advantageous moves for the current player, we increase the odds of pruning early. A transposition table is simply a collection of states that are favorable to players. The board above is a great state for the x player. If it was one of the possible moves for the x player and it was stored in a hash table of good moves, then we could move it to the front of the action list. Assuming that the transposition table is specific to a player or that the turn is part of the state, one can also cache the value associated with the state and avoid exploring the subtree multiple times.

2. Chance nodes Γ and Ψ have outcomes: A, B, C, and D for Γ and E and F for Ψ . Given the following table of probabilities and utilities, would a player maximize their utility by selecting Γ or Ψ ?

P(outcome)	utility
P(A)=.35	10
P(B)=.50	15
P(C)=.05	29
P(D)=.10	14
P(E)=.25	18
P(F)=.75	13

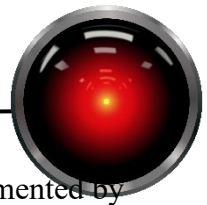
Show your work.

$$\Gamma = .35 \cdot 10 + .5 \cdot 15 + .05 \cdot 29 + .10 \cdot 14 = 13.85$$

$$\Psi = .25 \cdot 18 + .75 \cdot 13 = 14.25$$

The action that leads to chance node Ψ is the better choice.

3. The CheckerBoard class in the programming assignment below cannot detect stalemates that occur when the board is in the same configuration three different times. How could one modify the class to detect this efficiently? (No



implementation is required, just well laid out plan that could be implemented by any skilled computer scientist.)

Answers may vary. One suggestion: create a hashtable. Each time a move is made, use the state as a hash table key. If the key is not in the table, add it and set the value to 1. On subsequent uses, increment the value. If the value is 3, it means that the state has been visited 3 times and a stale mate has occurred.