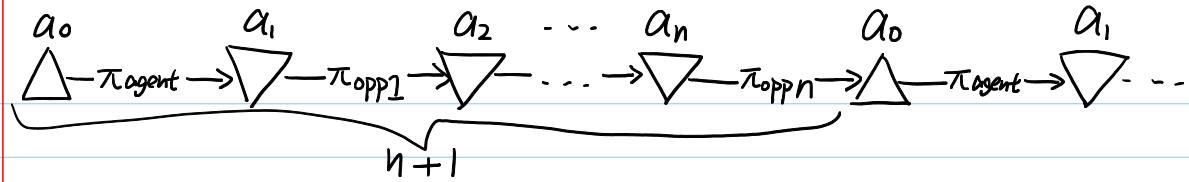


Jing (Thomas) Zhang



Problem 1 Minimax

$$V_{\text{minimax}}(s, d) =$$

$$\begin{cases} \text{Utility}(s) & \text{IsEnd}(s) \\ \text{Eval}(s) & d=0 \\ \max_{a \in \text{Action}(s)} V_{\text{minimax}}(\text{Succ}(s, a), d) & \text{Player}(s) = a_0 \\ \max_{a \in \text{Action}(s)} V_{\text{minimax}}(\text{Succ}(s, a), d) & \text{Player}(s) \in \{a_i \mid 1 \leq i \leq n-1\} \\ \max_{a \in \text{Action}(s)} V_{\text{minimax}}(\text{Succ}(s, a), d-1) & \text{Player}(s) = a_n \end{cases}$$

where  $a_n$  is the last player (ghost) since in depth-limited search we decrement depth @ last player's turn.

Problem 3

$$V_{\text{expectimax}}(s, d) =$$

$$\begin{cases} \text{Utility}(s) & \text{IsEnd}(s) \\ \text{Eval}(s) & d=0 \\ \max_{a \in \text{Action}(s)} V_{\text{expectimax}}(\text{Succ}(s, a), d) & \text{Player}(s) = a_0 \\ \sum_{a \in \text{Action}(s)} \frac{1}{|\text{Action}(s)|} V_{\text{expectimax}}(\text{Succ}(s, a), d) & \text{Player}(s) \in \{a_i \mid 1 \leq i \leq n-1\} \\ \sum_{a \in \text{Action}(s)} \frac{1}{|\text{Action}(s)|} V_{\text{expectimax}}(\text{Succ}(s, a), d-1) & \text{Player}(s) = a_n \end{cases}$$

$\uparrow$   
 $\pi_{\text{ghost}}$  for  $a_1$  to  $a_n$