

Introduction to  
Artificial Intelligence and Machine Learning  
Homework 2 – Multiagent

2019/10/16

# Question 1 –Reflex Agent

- Given a game state, a reflex agent chooses the action that leads to the highest value of evaluation function.
- evaluationFunction (self, currentGameState, action)
  1. Generate successor
  2. Return score of the successor

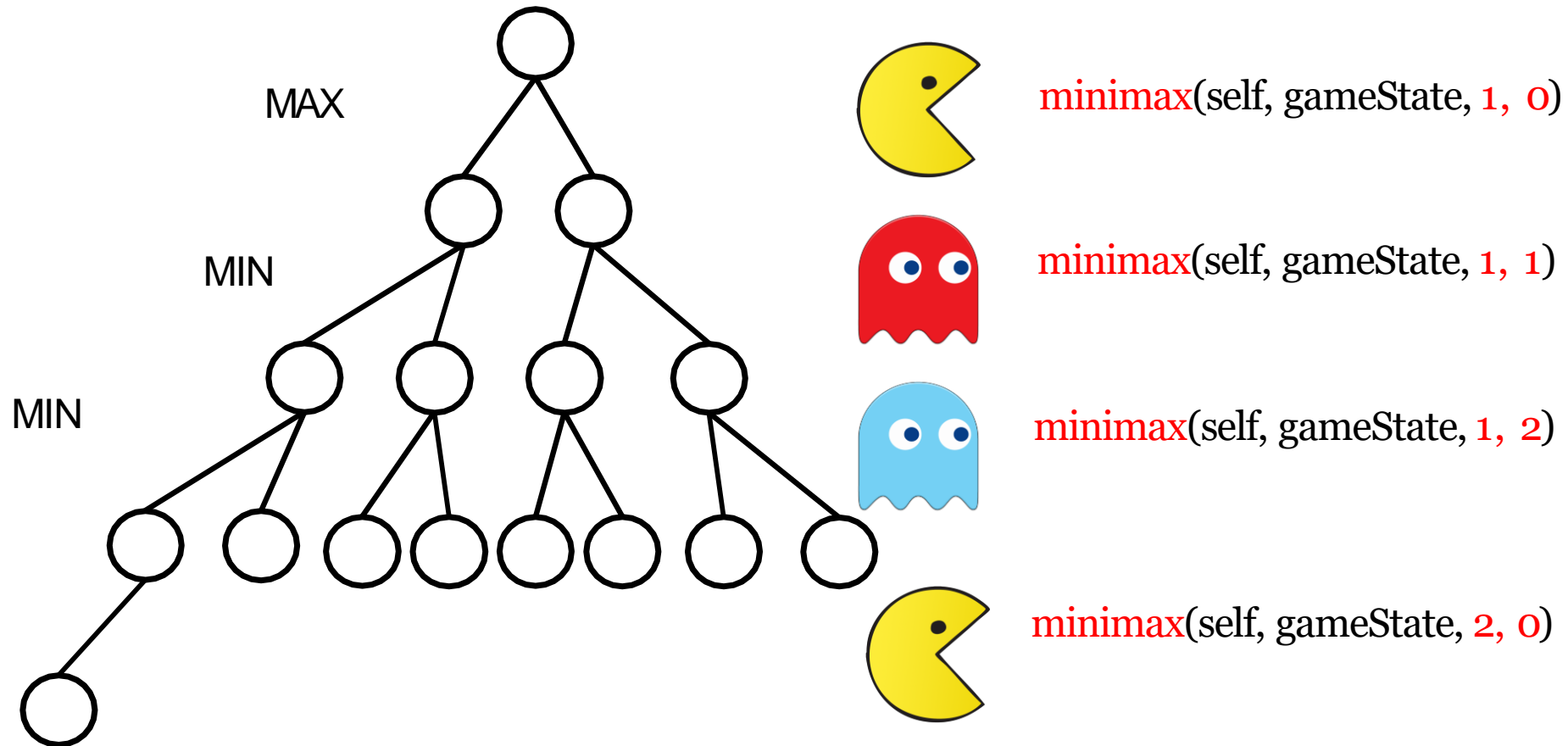
Hints:

1. Avoid the ghosts
2. Move toward the nearest food
3. Eat the capsule then go chasing the ghosts

# Question 2 –Minimax Agent

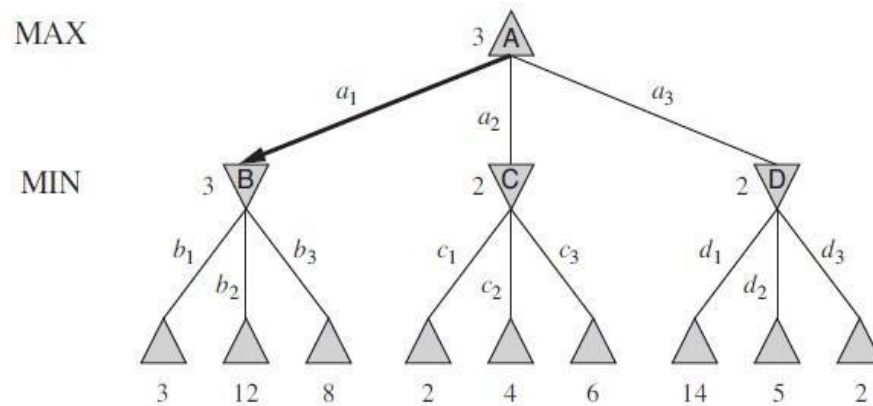
- Given a game state, a reflex agent chooses the action that leads to the highest value of evaluation function.
- `getAction(self, gameState)`
  1. Evaluate best action by **minimax**
  2. Return best action
- **minimax** (self, gameState, **depth**, **agentIndex**)
  - 1 depth: MAX, MIN, MIN, ... , MIN
  - recursive call

# Question 2 –Minimax Agent



# Question 2 – Minimax Agent

$$\text{MINIMAX}(s) = \begin{cases} \text{UTILITY}(s) & \text{if } \text{TERMINAL-TEST}(s) \\ \max_{a \in \text{Actions}(s)} \text{MINIMAX}(\text{RESULT}(s, a)) & \text{if } \text{PLAYER}(s) = \text{MAX} \\ \min_{a \in \text{Actions}(s)} \text{MINIMAX}(\text{RESULT}(s, a)) & \text{if } \text{PLAYER}(s) = \text{MIN} \end{cases}$$



Minimax Search

# Question 3 –Alpha Beta Agent

- `getAction(self, gameState)`
  - nearly the same as minimax agent
- `alphabeta(self, gameState, depth, agentIndex, alpha, beta)`

# Question 4 –Expected Minimax Agent

- `getAction(self, gameState)`
  - nearly the same as minimax agent
- `expectiMinimax(self, gameState, depth, agentIndex)`
  - nearly the same as minimax agent, except...
  - The ghosts don't return the min of all game values, they return the average of them.

# Question 5 –Better Evaluation Function

- Originally, the evaluation is based on the score of the given state.
- Try to “eat” the ghost in the game !
- This evaluation function is different from the one of Question 1 in that here the evaluation is only a function of game state, where as in Question 1 the evaluation is a function of game state and action.
- Remember to **write your documentation (in .pdf)** !
- Hints: Run BFS to find ghosts and foods; Eat capsules and chase ghosts.



# Additional

- Use .zip or .gz file (no .rar or anything else) to package the files you need to submit (no other unnecessary files).
- Verify your uploaded file by downloading it on ceiba.
- Check the deadline carefully.

# Deadline

- 2019/10/30 27:00 (2019/10/31 03:00)
- Allow late submission until 2019/11/07 27:00