

Assignment-2

Name: Dinesh Anand SS

UIN:679130316

Net-id: dsivas3

1. Goal Based Agents vs Utility Based Agents:

- a. Goals just provide a binary distinction between “happy” and “unhappy” states. The reward function of goal based agent is either 0 (nothing achieved) or 1 (successful) whereas utility allows to measure exactly “how happy” an agent is in a particular state.
- b. A goal based agent chooses actions which aids it in achieving the goal whereas a utility based agent chooses the action that maximizes the expected utility of the action outcomes (which is calculated given the probabilities and utilities of each outcome).
- c. Ex. In a 15 puzzle game a goal-based agent is rewarded only if the puzzle is completely solved (goal) whereas a utility based agent can be rewarded for near-goal states (like correct arrangement of first 2 rows).

2. Star Game:

- a. **Partially Observable:** The environment is partially observable if the agent doesn't have any information regarding the position of the stars and has to move randomly and pick up the stars if it encounters one.
Fully Observable: The environment is fully observable if the agent has complete information of 4*3 grid (with position of the stars). Now the agent can move suitably and pick up the stars.
- b. **Deterministic:** Given the initial state (say S0) of the agent and information about the environment (say fully observable), the agent can either move up or down or right or left or pick up stars and for either of these actions performed the agent will result in a particular state (say S1) with 100% probability, So the environment is deterministic.
Stochastic: If we tweak the game and add a mechanism in which location of stars change probabilistically then it becomes stochastic environment.
- c. **Dynamic:** If the location of the stars or the agent changes with respect to time (while the agent is deliberating) then the environment is said to be dynamic
Static: If the location of stars and the agent remains the same while the agent is deliberating then it's said to be static.
- d. **Episodic:** If the current decision to move in a direction or pick up stars does not affect agent's performance measure to move or pick up stars in another state/round then it's episodic.
Sequential: Consider a penalty associated with each move the agent makes, until all stars are picked up then the environment is sequential because the current decision to move in one direction affects the performance measure (maximize the score) while picking up another star within the same game.
- e. **Known:** If the outcomes for all actions (move up, down, left, right and pick up stars) is given or a probability is specified then it's a known environment.

Unknown: Consider the agent doesn't know regarding the penalties given for movement and points given for picking up stars but the agent works to maximize the score then agent has to learn how it works in order to make good decisions and that type of environment is referred as unknown.

- f. **Single Agent:** The environment in which only one agent works on to maximize the performance measure is called a single agent environment.

Multiple Agent: Consider another agent which moves from right to left and picks up stars and whoever picks up more stars wins, now it becomes a competitive multi-agent environment.