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Q.1: Exercise 3.1, page 85

Exercise 3.1 Devise three example tasks of your own that fit into the reinforcement learning framework, identifying for each its states, actions, and rewards. Make the three examples as different from each other as possible. The framework is abstract and flexible and can be applied in many different ways. Stretch its limits in some way in at least one of your examples.

Bowling: Bowling is a target sport and recreational activity in which a player rolls a ball toward pins or bottles

Image source: https://www.google.com/url?sa=i&url=https%3A%2F%2Fblogpakistan.pk%2Fbowling-alleys-in-karachi%2F&psig=AOvVaw1MZ5opJ30OhygIsdOtHjj7&ust=1676303393228000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCPjA8fSqkP0CFQAAAAAdAAAAABAJ

- State: Coordinates of ball; Size of Ball, weight of Ball; Coordinates of Target.
- Action: (X,Y) direction of throw; power of throw
- Rewards: -1 for each remaining pin

Stick Balancing Robot:

A robot trying to balance a pole over finger.

Image Source: https://www.google.com/url?sa=i&url=https%3A%2F%2Frecordsetter.com%2Fworld-record%2Fbalance-stick-

finger%2F18007&psig=AOvVaw2HzSuw12nWr8WFiWjOmDcB&ust=1676305300087000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCJjz2IGykP0CFQAAAAAdAAAAABAi

- State:
    - (x,y,z) coordinates of arm
    - v: The horizontal velocity of the Robot
    - θ: the angle between the pole and the vertical position

- Actions:
    - Moving arm left right, forward backward to balance
- Reward:
    - +1 for every second it is balancing
    - -5 for every time it gets dropped

  The goal is to get the highest reward as possible.

Jigsaw puzzles:

- State: The arrangement of all the pieces
- Actions:
    - Exchange of two pieces
    - Don't change, supposing if two pieces are placed correctly next to each other, then they are locked.
- Reward:
    - -1 for each position exchange
    - + 1 for each 'lock'
    - A large +100 reward for completing the Jigsaw puzzles.