

Q-Learning Agent for Snake Game - Report

Objective

The objective of this exercise was to train an agent using Q-Learning to play a Snake game, demonstrating reinforcement learning techniques.

Approach

The Q-Learning algorithm was employed. States were represented by the snake's head position, food position, current direction, and visited positions. The reward function incentivized eating food, discouraged revisiting positions, and penalized collisions.

Implementation Details

The training process involved 1000 episodes. An epsilon-greedy strategy was used for exploration, with epsilon decaying over time to favor exploitation. Challenges included balancing exploration and exploitation, as well as preventing excessive penalties for revisited positions.

Results

The agent demonstrated improvement over episodes, achieving higher average rewards and scores. Graphs of training progress showed a steady increase in performance.

Discussion

Challenges included managing the large state space due to the high-dimensional state representation. Possible improvements include using function approximation (e.g., neural networks) to handle large state spaces and refining the reward structure.

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Conclusion

The Q-Learning agent successfully learned to play the Snake game. Key insights include the importance of reward function design and exploration strategies in reinforcement learning.