Online Policy Training vs Heuristic Search Using Reinforcement Learning to Avoid Dynamic Obstacles

cs980 project

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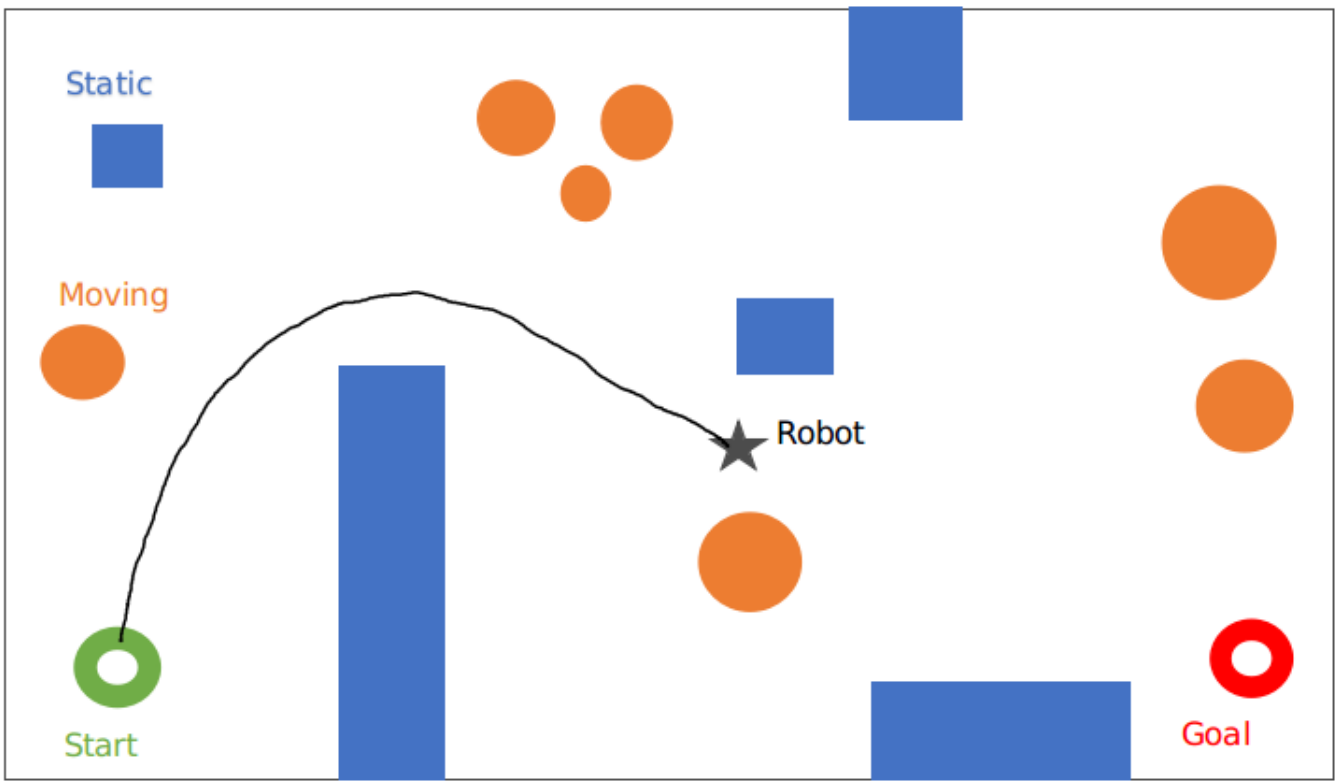
MOTIVATION

- Avoid dynamic obstacles is crucial
  - Autonomous vehicle navigation
  - Indoor robot navigation

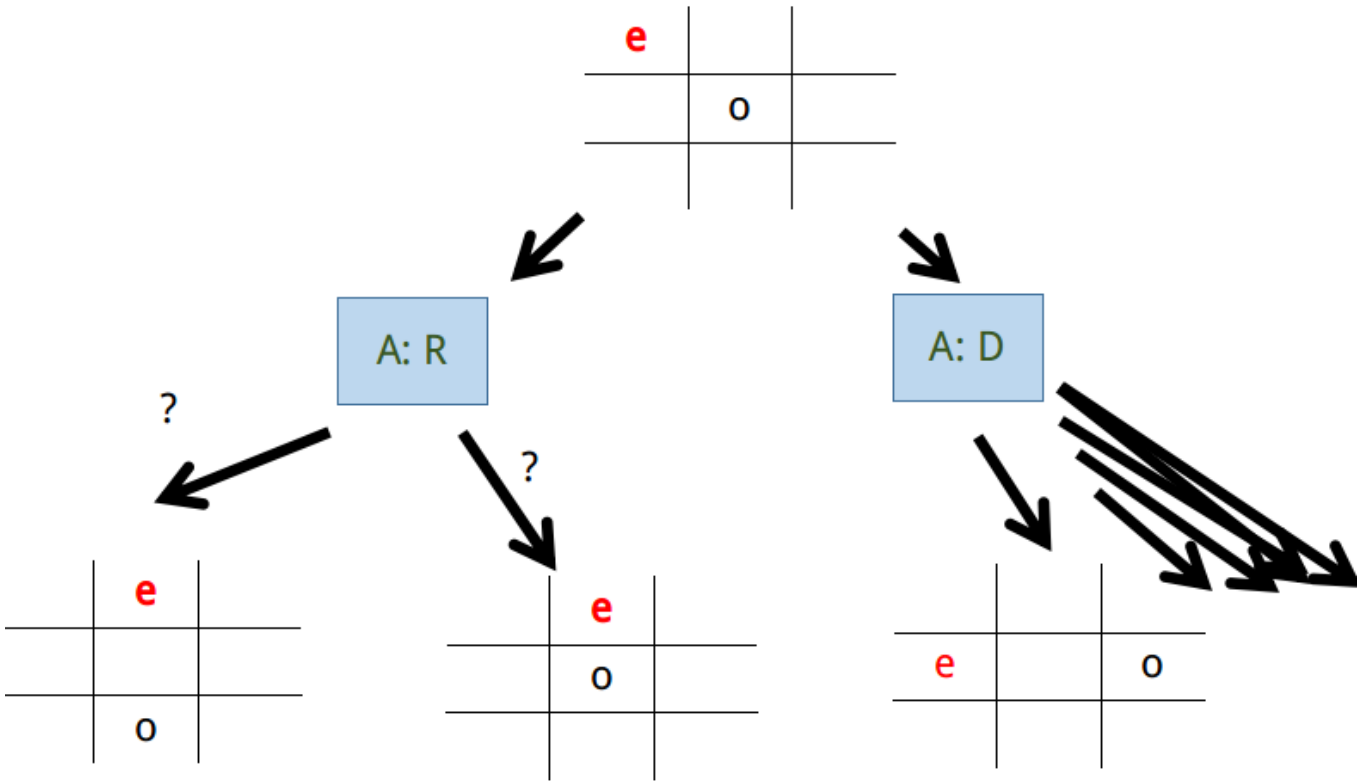
ONLINE POLICY TRAINING

- Given start state, goal state, and static obstacles
- Compute online policy based on observation of dynamic obstacles



ONLINE POLICY TRAINING: MDP

- MDP:
  - States: grid world states
  - Actions: up, down, left, right
  - Rewards: goal: 1, collision: -1000
  - Transition: Unknown



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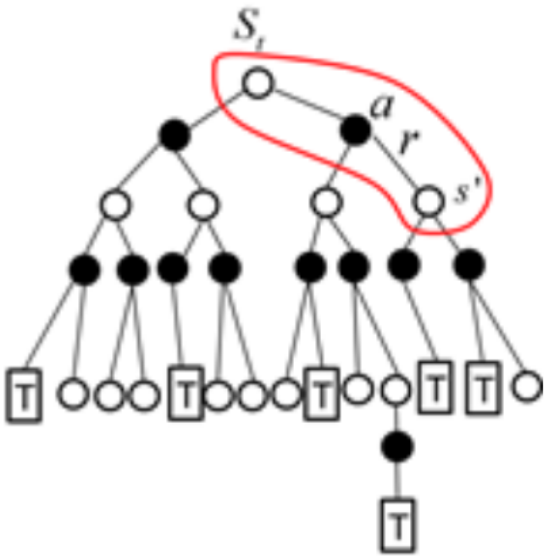
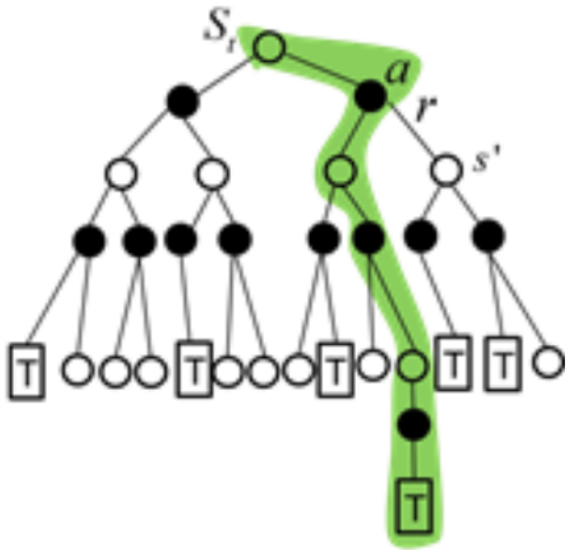
  - Transition: Unknown
- Approach:
  - TD(λ), Q learning, Sarsa
  - Monte Carlo Tree Search





ONLINE PATH PLANNING

- Real Time Heuristic Search
  - estimate obstacles' movement
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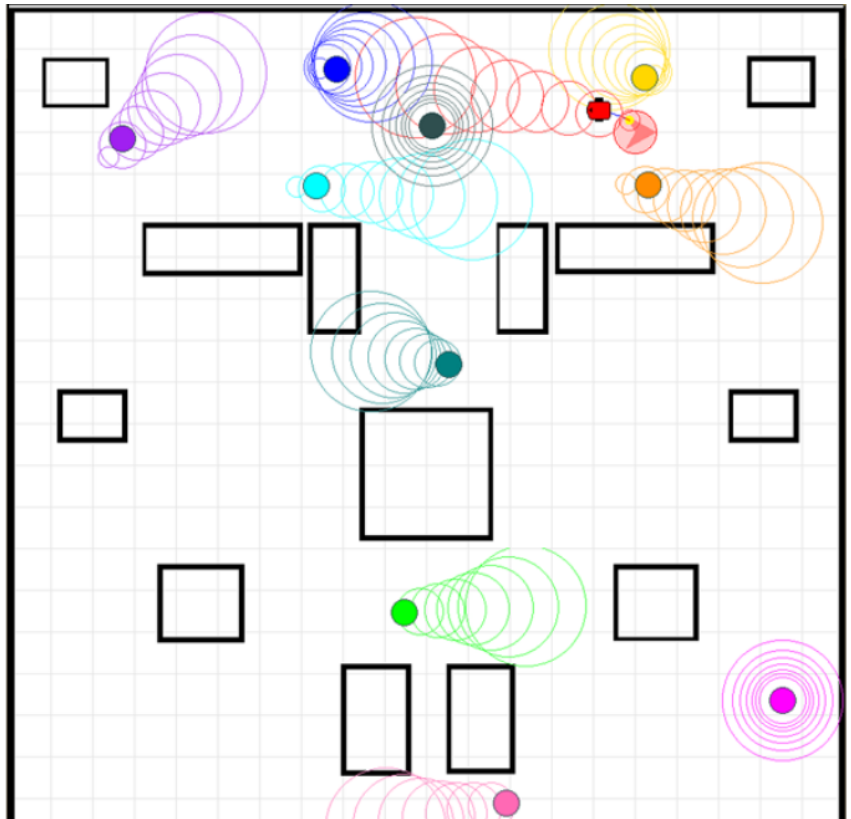
  - Greedy, A*
  - LSS-LRTA*



EXPERIMENT

- Compare Policy Training vs Heuristic Search
- Theoretically prove the value functions are the same