Learning Subgoals in Hierarchical Reinforcement Learning

Justin Li

University of Michigan

Automatic Task Decomposition

- Motivation
  - Most tasks broken down by humans
- Goal
  - Automatically build operator hierarchy
- Constraints
  - Online
  - Non-episodic environment (if possible)

Direction

- Previous work in Hierarchical Reinforcement Learning

- Implications

  - Create operator application rules
  - Create operator proposal rules

Creating Operators

- Designed to reach specified state ("subgoal")
- Relative Novelty (Şimşek and Barto, 2004)
    - Intuition: states new to the agent
- Local Graph Min Cut (Şimşek et al., 2005)
    - Intuition: bottlenecks in state graph
- Other offline, episodic algorithms

Creating Proposals

- Specifically, *not* proposing operators

- Early work on reducing search in classical planning (Knoblock, 1990)

  - Intuition: unique operators on goal literals are applied last

- Action model required

Soar Support

- Soar-RL
- Episodic Memory
- Others?

Evaluation

Gold Nuggets

- Possible state-based subgoals exist
- Soar already supports creating these subgoals

Coal Nuggets

- Uncertain when operators for subgoals should be proposed

Questions?