**SPUDD**

Stochastic Planning using Decision Diagrams

**Motivation**

- **MDPs**
  - Markov Decision Processes
  - Assumptions:
    - MDPs: Markovian processes
    - Finite set of states, actions, and rewards
    - Actions induce state transitions
    - Real-valued reward function

- **ADDs**
  - Algebraic Decision Diagrams
  - What are they?
    - Generalization of Bryant's Library Decision Diagrams (ADDs)
    - Represent real-valued boolean functions
  - Other dynamic programming algorithms
  - Space/Time optimizations
  - Dynamic Variable Re-ordering

**SPUDD Algorithm**

1. **Value Iteration**
   - Sum out all
   - Set $V_0$ (the $0$-stage to go value function)

2. **Set $V_{n+1}$ (the $n$-stage to go value function)**
   - $V_{n+1} = \beta \sum_a P(s,a,t) V(t)$

3. **Repeat until $\| V_{n+1} - V_n \| < \epsilon (1 - \beta)$**

4. **Do this for each action**
   - Assign to terminal nodes actions which contributed in the maximization

**Results**

- **Space Savings**
  - From using ADDs
  - Tree nodes/ADD nodes

- **Running Time**
  - SPUDD

**Future Work**

- ASPUDD: Application methods using ADDs
- Dynamic Variable Re-ordering
- Space/Time optimizations
- Other dynamic programming algorithms

**SPUDD on the Web**

- Run SPUDD on your own data
- Browse problem examples