Artificial Intelligence Foundations and Applications

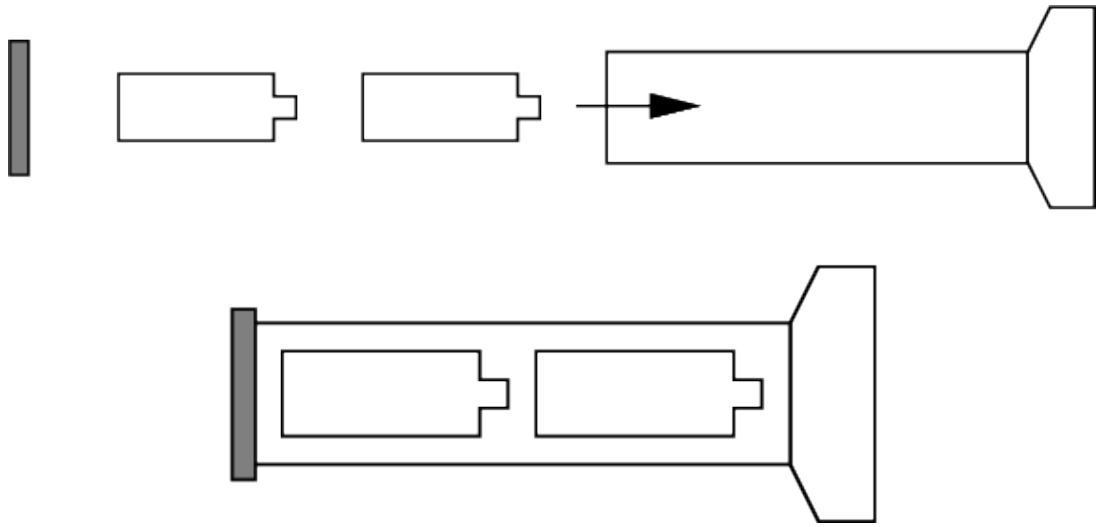
Tutorial

Sudeshna Sarkar

Centre of Excellence in Artificial Intelligence, IIT Kharagpur

1. Convert the planning problem into SAT formula which can be input to a SAT-solver to find a plan of length 3 if such a plan exists.

Putting Batteries into a Flashlight



Objects: Battery1, Battery2, cap, Flashlight

Predicates: On(x,y), In(x,y)

On(Cap, Flashlight)

In(Battery1, Flashlight), In(Battery2, Flashlight)

Start: On(Cap,Flashlight), ¬In(Battery1, Flashlight), ¬In(Battery2, Flashlight)

Goal: On(Cap,Flashlight), In(Battery1, Flashlight), In(Battery2, Flashlight)

Name	Preconditions	Effects
$PlaceCap$	$\{\neg On(Cap, Flashlight)\}$	$\{On(Cap, Flashlight)\}$
$RemoveCap$	$\{On(Cap, Flashlight)\}$	$\{\neg On(Cap, Flashlight)\}$
$Insert(i)$	$\{\neg On(Cap, Flashlight), \neg In(i, Flashlight)\}$	$\{In(i, Flashlight)\}$

2. Construct the planning graph for the following planning task. Show the mutexes at every action and proposition level.

- Initial Conditions: garbage, cleanHands, quiet
- Goal: dinner, present, ¬garbage
- Actions:
  1. Cook Precondition: cleanHands
     Effect: dinner
  2. Wrap: Precondition: quiet
     Effect: present
  3. Carry Precondition:
     Effect: Effect: ¬garbage, ¬ cleanHands
  4. Dolly: Precondition:
     Effect: ¬garbage, ¬quiet

3. MDP

In the grid world there are 4 actions: {up, down, left, right}.
Discounted reward $\gamma = 0.9$

1. Calculate Q*(s,a), V*(s) and $\pi *$ for all states in Fig 1
2. When another goal is added (Fig 2), show the changed optimal policy for all states.

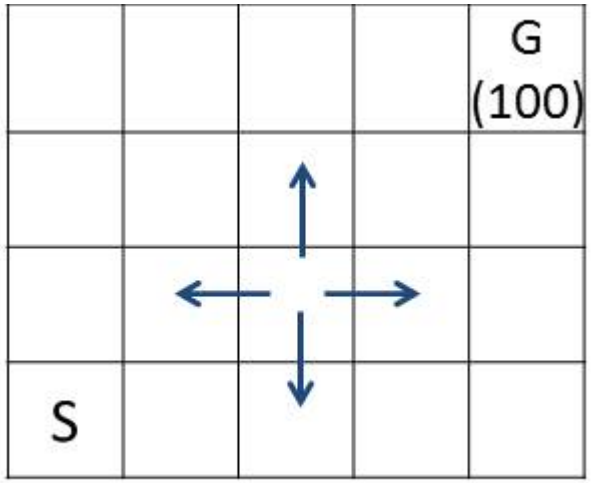


Fig 1

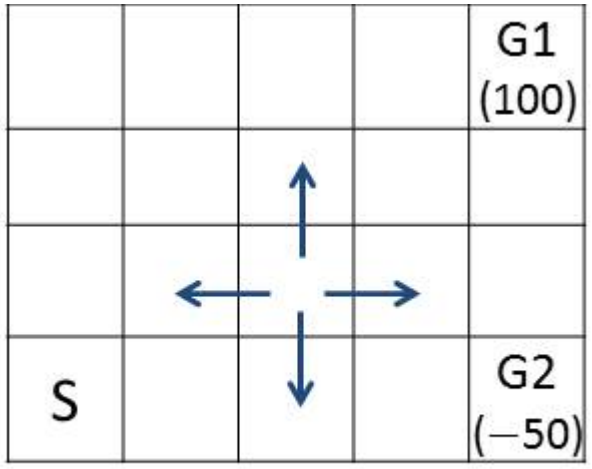


Fig 2