

Worksheet: L09 – Planning Graphs

CSCI-534: Robot Planning & Manipulation

Spring 2020

<http://www.neil.dantam.name/rpm/B09-graphplan.pdf>

You may use this handout to attempt the examples presented on the slides.

1. Construct the planning graph for the domain in Figure 1.

```
(define (domain cake-domain)
  (:predicates (have ?x)
               (eaten ?x))
  (:action eat :parameters (?x)
            :precondition (have ?x)
            :effect (and (not (have ?x))
                         (eaten ?x)))
  (:action bake :parameters (?x)
            :precondition (not (have ?x))
            :effect (and (have ?x))))
```

(a)

```
(define (problem have-and-eat-cake)
  (:domain cake-domain)
  (:objects cake)
  (:init (not (have cake)))
  (:goal (and (have cake)
              (eaten cake))))
```

(b)

Figure 1: Cake Domain

Name:

2. Draw one level of the planning graph for the domain in Figure 2. You may omit the following constant predicates to make the drawing neater: `plane(?x)`, `cargo(?x)`, `airport(?x)`.

```
(define (domain air-cargo)
  (:predicates (plane ?x) (cargo ?x)
               (airport ?x) (at ?x ?y))
  (:action fly :parameters (?p ?x ?y)
   :precondition
   (and (plane ?p) (airport ?x) (airport ?y)
        (at ?p ?x)))
   :effect (and (not (at ?p ?x)) (at ?p ?y)))
  (:action load :parameters (?c ?p ?a)
   :precondition
   (and (cargo ?c) (plane ?p) (airport ?a)
        (at ?c ?a) (at ?p ?a)))
   :effect (and (not (at ?c ?a)) (at ?c ?p)))
  (:action unload :parameters (?c ?p ?a)
   :precondition
   (and (cargo ?c) (plane ?p) (airport ?a)
        (at ?c ?p) (at ?p ?a)))
   :effect (and (not (at ?c ?p)) (at ?c ?a))))
```

(a)

```
(define (problem air)
  (:domain air-cargo)
  (:objects cargo-0 cargo-1
            plane-0 plane-1
            ATL SFO)
  (:init (cargo cargo-0)
         (cargo cargo-1)
         (plane plane-0)
         (plane plane-1)
         (airport ATL)
         (airport SFO)
         (at plane-0 ATL)
         (at plane-1 SFO)
         (at cargo-0 ATL)
         (at cargo-1 SFO))
  (:goal (and (at cargo-0 SFO)
              (at cargo-1 ATL))))
```

(b)

Figure 2: Air Cargo Domain