

# Optional Homework

Artificial Intelligence I — CS475/CS505

Deadline: May 8, 11:55pm

May 3, 2007

Consider the logistic domain

The post office needs to deliver packages to different people in different cities. They use either airplanes or trucks to transport the packages from locations to locations. Airplanes are used to transport packages between big cities (e.g. El Paso, Los Angeles, etc.), and trucks are used to deliver packages from airports to different locations within the city reach (e.g. from El Paso to Las Cruces but not from El Paso to Dallas).

Given that we have

- two big cities  $C_1$  and  $C_2$  with airport named  $C_1$  and  $C_2$  respectively;
- one airplane  $A$ ;
- three locations  $L_1, L_2$  and  $L_3$  where  $L_1$  and  $L_2$  are within the reach of  $C_1$  and  $L_3$  is within the reach of  $C_2$ ;
- two trucks  $T_1$  and  $T_2$ ;
- two packages  $P_1$  and  $P_2$ ; and
- initially,  $T_1$  is at  $L_1$ ;  $T_2$  is at  $L_3$ ;  $P_1$  is at the airport of  $C_1$ ;  $P_2$  is at the airport of  $C_2$ ;  $A$  is at  $C_1$ .

Represent the above domain using the two formalisms

- situation calculus
- action language

with the set of fluents and actions

- $At(o, l)$  (meaning: the object  $o$  is at the location  $l$ )
- $Flight(a, c_1, c_2)$  (meaning: airplane  $a$  flights from  $c_1$  to  $c_2$ )
- $Load(p, a.t, l)$  (load package  $p$  into airplane or truck  $a.t$  at location  $l$ )
- $Unload(p, a.t, l)$  (unload package  $p$  from airplane or truck  $a.t$  at location  $l$ )
- $Drive(t, l_1, l_2)$  (driving truck  $t$  from location  $l_1$  to location  $l_2$ )

and anything that you think reasonable to add.

Using your representation, show that package  $P_1$  will be at location  $L_3$  after the following sequence of actions is executed in the initial state:

$$Load(A, P_1, C_1), Flight(A, C_1, C_2), Unload(A, P_1, C_2), Drive(T_2, L_3, C_2), \\ Load(T_2, P_1, C_2), Drive(T_2, C_2, L_3), Unload(T_2, P_1, L_3)$$