Assignment 10:
Linear Logic

15-317: Constructive Logic

Out: Friday, November 28, 2008
Due: Friday, December 5, 2008

1 Linear Logic Derivations (20 points)

Do Exercises 12.2 and 12.3 from the Linear Logic notes linked from the course Web site.

2 Planning (20 points)

In class, we discussed using linear logic to model planning problems. In this problem, you will use a linear logic theorem prover to solve such a problem. Code for the blocks-world example is linked from the assignments page. Your task is to model the following planning domain:

> Various pieces of cargo are at various locations. Various planes are at various locations. Cargo at the same location as a plane can be loaded onto that plane. A plane can carry an unlimited amount of cargo. Cargo can also be unloaded from a plane to a location. A plane can fly from one location to another, but this consumes all the plane's gas. At certain locations, a plane can fill up its gas tank. These locations can supply an unlimited amount of gas if planes stop there multiple times, but a plane can only carry enough gas for one flight at a time.

Task 1 (20 pts). Give rules for this planning domain, using the following predicates:

- `cargoAt(O,L)` Cargo O is at location L
- `planeAt(P,L)` Plane P is at location L
- `aboard(O,P)` Cargo O is in plane P
- `hasFuel(P)` and `noFuel(P)` Plane P does / doesn't have gas.
- `gasAvail(L)` Location L has gas available.

The syntax for the theorem prover is as follows:

$\forall x.A$	`(x) A`
$A_1 \oplus A_2$	`A1 * A2`
$A_1 \multimap A_2$	`A1 -o A2`
$\top$	`#`

3 Handin

- Run the theorem prover as follows:

  ```
  /afs/andrew/course/15/317/bin/kaustuv-lltp <yourfile.sym>
  ```

- To handin, copy files `hw10.pdf` and `hw10.sym` to your handin directory.