CPSC 522 — Spring 2013
Assignment 2

Due: 12:30 p.m., Wednesday 6 February 2013.

Question 1

Solution

(a) There are 3^2 different ϕs and 2^3 different assignments for for each of p, q, r. Therefore there are

$$3^2 \times (2^3)^3 = 4608 \text{ interpretations}$$

(b) One model is where ϕ maps all constants to ✂, and all atoms are true.

(c) One non-model is where ϕ maps all constants to ✂, and all atoms are true, except for $\pi(p)(\langle ☎ \rangle) = false$.

(d) Atoms that are logical consequences of the knowledge base: $q(a), r(b), p(a), p(b)$

(e) Atoms that are not logical consequences of the knowledge base: $q(b), r(a)$

(f) Split into two cases:

- a and b denote same individual (i.e., $a = b$). There are 3 ϕs. For that individual, p, q and r must all be true. For each of the other individuals, there are 5 assignments that satisfy the KB (4 corresponding the combinations of assignment to q and r and, for the assignment with q is false and r is false there are 2 assignments to p). Thus there are $3 \times 5 \times 5 = 75$ models for which $a = b$.
- a and b denote different individuals (i.e., $a \neq b$). There are 6 ϕs. For the a individual, there are two assignments for r. For the b individual, there are two assignments for q. For the other individual there are 5 assignments. This there are $6 \times 2 \times 2 \times 5 = 120$.

Thus there are $75 + 120 = 195$ models.

Question 2

Solution See the code at:
`http://cs.ubc.ca/~poole/cs522/2013/as2/movie.ailog`

(a)
```
likes_movie_by(P,D) <-
      rating(P,M,V) &
      V > 2 &
      director(M,D).
```

(b)
```
namesake_of_director(P) <-
      rating(P,M) &
      director(M,D) &
      P \= D &
      name(P,F,L) &
      name(D,F,L).
```

(c)
```
likes_latter_movie(P,D) <-
      rating(P,M1,R1) &
      director(M1,D) &
      rating(P,M2,R2) &
      director(M2,D) &
      year(M1,Y1) &
      year(M2,Y2) &
      Y1 < Y2 &
      R1 < R2.
```

(d) We need to reify the rating, and then have the following triples:

```
prop(R,person_rating,P)
prop(R,movie_rated,M)
prop(R,rating_value,V)
prop(M,director,D)
prop(M,year,M)
prop(P,first_name,F)
prop(P,last_name,L)

prop(P,likes_movie_by,D) <-
   prop(R,person_rating,P) &
   prop(R,movie_rated,M) &
   prop(M,director,D) &
   prop(R,rating_value,V) &
   prop(V,>,2).
```

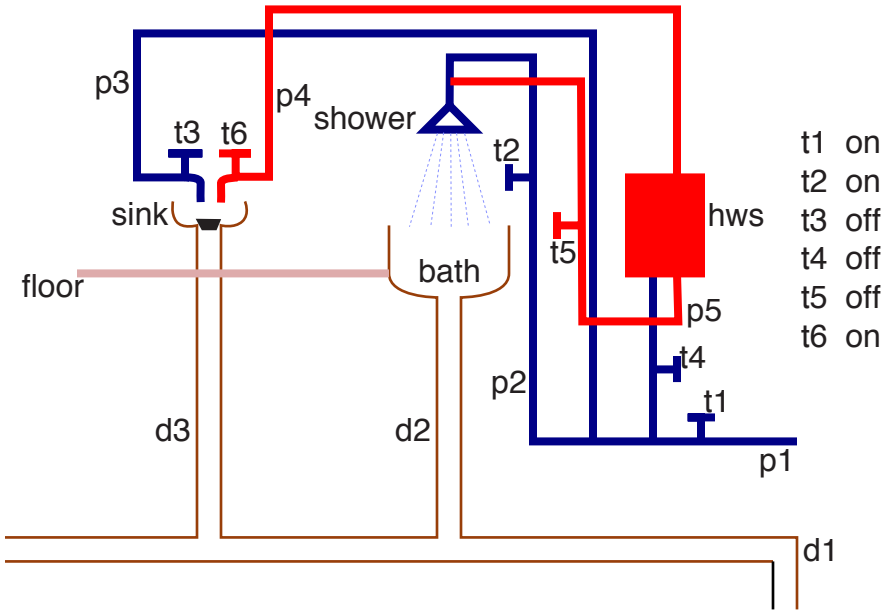

Figure 1: A Plumbing Domain with individuals named

Question 3

Solution See the program `http://cs.ubc.ca/~poole/cs522/2013/as2/plumbing_sol.ailog`

One of the limitations of the askable mechanism is that we can only observe leaves, but then we don't try to prove them. In probabilistic reasoning is we have an arc $A \rightarrow B$, the user can observe either A or B and ask for the probability of the other, but the Ailog program doesn't let us do this.

Question 4

How long did the assignment take? What did you learn? Was it reasonable? What suggestions do you have to improve the assignment?

Solution You were supposed to learn that it is not easy to represent a domain so that we can answer questions, but when it is represented, there are many sorts of questions that can be asked.