CPSC 522 — Spring 2012
Assignment 1 — Solution

Due: 12:30 p.m., Wednesday 18 January 2012.

Question 1

Solution

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

$$3^3 \times 2^9 = 13824 \text{ interpretations}$$

(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 $\pi(p)(\langle ☎ \rangle) = \textit{false}$.

(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: $p(c), q(b), q(c), r(a), r(c)$

(f) Split into two cases:

- a and b denote same individual (i.e., $a = b$). There are 9 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 $9 \times 5 \times 5 = 225$ models for which $a = b$.

- a and b denote different individuals (i.e., $a \neq b$). There are 18 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 $18 \times 2 \times 2 \times 5 = 360$.

Thus there are $225 + 360 = 585$ models.

Question 2

```
ailog: load 'plumbingbuggy.ailog'.
AILOG theory plumbingbuggy.ailog loaded.
ailog: ask wet(floor).
Answer: wet(floor).
 Runtime since last report: 0 ms.
  [ok,more,how,help]: how.
   wet(floor) <-
      1: wet(sink)
      2: plugged(sink)
   How? [Number,up,retry,ok,prompt,help]: how 1.
   wet(sink) <-
      1: on(t6)
      2: pressurised(p4)
   How? [Number,up,retry,ok,prompt,help]: how 2.
   pressurised(p4) <-
      1: pressurised(hws)
   How? [Number,up,retry,ok,prompt,help]: how 1.
   pressurised(hws) <-
      1: on(t2)
      2: pressurised(p2)
   How? [Number,up,retry,ok,prompt,help]:
```

The buggy rule is:

```
   pressurised(hws) <-
      on(t2)
      pressurised(p2)
```

as the body is true and the head is false in the intended interpretation.

Question 3

Solution

(a) Here are 4 different solutions.

- For the first solution `http://artint.info/code/ailog/ailog_code/ch12/video.pl`, a segment is chosen that covers the first topic, and all of the topics that this segment also covers are removed from the list of topics left to cover.

- The second solution `http://artint.info/code/ailog/ailog_ code/ch12/video2.pl` is a directly recursive definition with no predicates defined other than those given.

- The third solution `http://artint.info/code/ailog/ailog_ code/ch12/video3.pl` uses an iterative method, where we define another predicate *add_to_presentation* that adds to existing an presentation to also include more topics. Presentation then asks to add the topics it must cover to an empty presentation.

- The fourth solution `http://artint.info/code/ailog/ailog_ code/ch12/video4.pl` generates presentations that satisfy the length criterion, and then tests them to see if they cover all of the topics. This is the only one that defines more than one extra predicate.

(b) Here are some ideas:

- Maybe we want some measure of quality rather than just a time limit (e.g., we may want the shortest presentation).

- We may want to return the best presentation first.

- We may want a sensible order to the presentation. (The current versions do not worry about the order of the clips within a presentation).

- We may want some continuity for the presentations; the video should flow, and be coherent.

- What presentation a person wants may not only depend on what they are interested in, but what they already know about.

- The terms used to describe the topics for the user may not necessarily match with the topics in the segments database. For example, they may just want something about CS research, in which case either computational intelligence or graphics would be OK. The system should do this automatically (the user need not know that there is computational intelligence research going on).

- There should still be a presentation if some topic cannot be covered. In this case we want the best presentation.

- The user may not know what sorts of things are in the video, even though they may be interested in it. We would like to implement "give me an interesting video that matches what I am interested in".