CSE 4/563 Knowledge Representation
Professor Shapiro
Homework 2
Maximum Points: 42
Due: 1:30 PM, Thursday, September 30, 2010

Name(s)⟨user name(s)⟩: _____

_____

September 23, 2010

You must turn in the answers to this homework set in a submitted file by 1:30 PM on the date shown above.

The submitted file must be named hw2.*ext*, for an appropriate value of *ext*. **Include your name(s) and user name(s) at the top of the file.** Submit that file by executing the Unix command

`submit_cse463 hw2.ext`

or

`submit_cse563 hw2.ext`

whichever is appropriate for you. The file can be a text file, or produced by some word processing software, but it must be formatted so it is easy to read.

You are also to submit two additional files, one for each exercise, as instructed below. The files must be named `tomsEvening.cl` and `tomsEvening.e`.

1. (36) For this exercise, you will finish formalizing and testing Tom's Evening Domain, and use `wang:entails` to check that the query is logically entailed by the knowledge base. Recall that the problem is

    Domain Knowledge: If there is a good movie on TV and Tom doesn't have an early appointment the next morning, then he stays home and watches a late movie. If Tom needs to work and doesn't have an early appointment the next morning, then he works late. If Tom works and needs his reference materials, then he works at his office. If Tom works late at his office, then he returns to his office. If Tom watches a late movie or works late, then he stays up late.

    Situation-Specific Assumptions: Tom needs to work, doesn't have an early appointment, and needs his reference materials.

    Query to be Proved: Tom returns to his office and stays up late.

(a) (11) Choose atomic propositions to represent the domain. In the class discussion, we have already identi-
fied the propositions in the domain. You just have to choose symbolic atomic propositions for them. Do
so putting in your answer file a filled-in version of the following list.

    i. (1) [_____] = There's a good movie on TV

    ii. (1) [_____] = Tom doesn't have an early appointment the next morning.

    iii. (1) [_____] = Tom stays home

    iv. (1) [_____] = Tom watches a late movie

    v. (1) [_____] = Tom needs to work

    vi. (1) [_____] = Tom works late

    vii. (1) [_____] = Tom needs his reference materials

    viii. (1) [_____] = Tom works

    ix. (1) [_____] = Tom is at his office

    x. (1) [_____] = Tom returns to his office

    xi. (1) [_____] = Tom stays up late

(b) (14) Using your atomic propositions, formalize the domain rules, the situation-specific assumptions, and
the query to be proved using the computer-readable syntax, CLIF. Put them in your answer file following
each of the sentences of the domain in the following order:

    i. (2) If there is a good movie on TV and Tom doesn't have an early appointment the next morning, then
he stays home and watches a late movie.

    ii. (2) If Tom needs to work and doesn't have an early appointment the next morning, then he works late.

    iii. (2) If Tom works and needs his reference materials, then he works at his office.

    iv. (2) If Tom works late at his office, then he returns to his office.

    v. (2) If Tom watches a late movie or works late, then he stays up late.

    vi. (2) Tom needs to work, doesn't have an early appointment, and needs his reference materials.

    vii. (2) Tom returns to his office and stays up late.

(c) (6) Add any additional background knowledge you need. This knowledge should be reasonable and should
not trivialize answering the query. You should not need to add additional atomic propositions. Rather,
you might need to add additional relations between some already chosen atomic propositions. List your
background knowledge in CLIF here in your answer file.

(d) (2) Make a copy of the file `/projects/shapiro/CSE563/Examples/Wang/tomsEvening.cl`.
Call your copy `tomsEvening.cl`. Add your material to your copy of the file. Insert that file into your
answer file here, and submit it.

(e) (3) Load and run your file by doing the following:

    i. Run Lisp by following the directions in the "System Documentation" page of the course web site.

    ii. Load the `wang` program by following the directions in the "System Documentation" page of the
course web site.

    iii. Change into the `wang` package by entering the Lisp command

        `:pa wang`

    iv. Load your Tom's Domain file.

    v. Have Lisp evaluate the expression

        `(entails KB Query)`

    vi. Exit Lisp by entering the Lisp command

        `:ex`

Insert the entire Lisp run into your answer file here:

2. (6) We can see the use of model-finding by giving the Tom's Evening Domain rules to decreasoner with a smaller set of situation-specific assumptions, and see what models satisfy those rules and assumptions.

   (a) (3) Prepare a file called `tomsEvening.e` to be input to `ubdecreasonerP.py`. In that file, put
      i. declarations of the atomic propositions,
      ii. the domain rules,
      iii. the additional background knowledge you found for the first exercise,
      iv. the two additional background knowledge rules (if necessary):
         Tom doesn't both stay at home and return to his office.
         If Tom watches a late movie, he stays home and stays up late.
      v. the situation-specific rule that Tom watches a late movie.

   Put that file here in your answer file, and submit it.

   (b) (3) Run `ubdecreasonerP.py` on `tomsEvening.e` to find the circumstances under which Tom can watch a late movie. List the distinct models that decreasoner found here in your answer file. (It seems that decreasoner might report the same model several times, but don't you list them repeatedly.)