

CSC 425/525 Homework #3 (Chapters 6 and 14)

Due: Wednesday, February 8

Word process your answers. Undergraduates answer question 1 four others. Graduate students answer all six.

1. We have the following rules (the values in parens denote salience). We start with working memory having a, b and c. We want to reach a conclusion of either x, y or z. Specify the order that rules are selected from the start state (a, b, c) until you reach one of x, y or z, based on the conflict resolution strategy listed.
  1. If a then d and e (.3)
  2. If b and c then f (.6)
  3. If a and f then g, h and i (.4)
  4. If e then i, j and k (.6)
  5. If h then k (.8)
  6. If g and i then k, m and n (.4)
  7. If j then o, p and l (.7)
  8. If k and m then q (.5)
  9. If b and n then r and s (.4)
  10. If j and l then t and u (.8)
  11. If q and s then v (.7)
  12. If r and u then x (.6)
  13. If t then y and k (.5)
  14. If l and v then z (.5)
  - a. Select first available (which has not already been selected)
  - b. Select rule with the most actions on the right hand side (on a tie, choose the first available)
  - c. Select the most specific rule (most conditions on the left hand side, on a tie, choose the first available)
  - d. Select the most salient rule (on a tie, choose the first available)
2. Recall that in medical diagnosis, we can break the problem into several distinct steps. Imagine that we want to build a rule-based system for how to design and implement a large software project.
  - a. What distinct steps (stages) would you have?
  - b. Provide 2-3 rules per step. Note that as step 1 would probably be complete before starting step 2 that some of the actions/conclusions from a rule in step 1 would probably be conditions for a rule in step 2.
3. Read problem 4 on page 220. Write the rules available for the ceremony (do not answer the question about writing a recursive algorithm). Each rule should appropriate state under what condition a particular move is allowed to be made.
4. Rules like those shown on pages 204 (8-puzzle) and 207 (Knight's tour) do not give any indication of when a rule should be applied. We might add conditions or salience values to make rules more applicable although in this case, there is little extra knowledge that would

be of use. Given the following rules for chess (and rules like these), specify whether it would be better to add more conditions or salience or both and explain why. C denotes a column (any column).

If white pawn at C, 2 and C, 3 is open then move it to C, 3

If white pawn at C, 2 and C, 3 and C, 4 are open then move it to C, 4

If white rook is at C, R and C, R+1 is open then move it to C, R+1

If white rook is at C, R and C, R+1 and C, R+2 are open then move it to C, R+2

etc. for all other rows and columns

5. We know the following:

1.  $P \rightarrow (Q \text{ OR } \sim R)$

2. P

3. R AND S

4. S AND Q  $\rightarrow$  T

5.  $\sim(T \text{ AND } \sim Z)$

Using the transformation rules in figure 14.1a (p 579) prove Z is true, using a proof like that of figure 14.1b (p. 580). In order to solve this problem, you may need the following additional rules.

A AND  $\sim A$  is false (R 13)

A OR false is A (R 14)

6. Given the following pieces of information

- If a person likes rock and classical music then the person will like prog rock
- If a person likes prog rock and jazz then the person will like the band Camel
- If a person likes prog rock and female vocalists then the person will like the band Renaissance
- If a person likes adventurous music then the person will like Frank Zappa's instrumental music
- If a person likes silly lyrics then the person will like Frank Zappa's vocal music
- If a person likes the band Camel then the person will like the bands Kansas, Genesis and Yes
- If a person likes the band Renaissance then the person will like the band Yes
- If a person likes the bands Yes and Frank Zappa's instrumental music then the person will like the band King Crimson
- Bill likes rock and jazz
- Jim likes rock, classical music, female vocalists and adventurous music
- Sue likes Kansas and silly lyrics
- Barb likes rock, classical music and female vocalists
  - a. Rewrite the pieces of knowledge in clausal form
  - b. Prove that Barb will like the band Yes using resolution and unification
  - c. Explain why you cannot prove that Barb will also like the band King Crimson
  - d. Answer the question "who will like King Crimson" through a proof using resolution and unification