

**Indian Institute of Technology Jodhpur**  
B.Tech.(CSE) 3rd Year, II Semester 2015-16  
CS323: Artificial Intelligence (Practice) Assignment # 2

1. Assume that  $\langle D, W \rangle$  be a propositional default theory, and  $D'$  be a set of normal defaults such that  $D \subseteq D'$ . If  $E$  is an extension of  $\langle D, W \rangle$ , then show that there exists an extension  $E'$  of  $\langle D', W \rangle$  such that  $E \subseteq E'$ .
2. Formalize these set of facts and default rules:
  - (a) Bob usually speaks the truth ( $d_1$ ).
  - (b) John usually speaks the truth ( $d_2$ ).
  - (c) Bob says that the suspect stabbed the victim to death ( $f_1$ ).
  - (d) John says that the suspect shot the victim to death ( $f_2$ ).
  - (e) Nobody can be both stabbed and shot to death ( $f_3$ ).
  - (f) Stabbing or shooting to death is killing ( $f_4$ ).

Answer these questions:

- (a) Did the suspect kill the victim according to default logic?
  - (b) Did the suspect kill the victim according to your intuitions?
3. Consider a robotic-hand which can move between several bins, pickup an object from the bin if the hand is above the bin and the hand is empty. The hand can drop an object into the bin if the hand is holding an object and the hand is above the bin. Moving of hand from any bin to any other bin is always possible, it does not require any preconditions. The actions are:

$drop(x, y)$  (drop object  $x$  into bin  $y$ )  
 $move(y)$  (move hand to be above the bin  $y$ )  
 $grab(x, y)$  (pickup object  $x$  from bin  $y$ ).

The fluents are:

$holding(x, s)$  (the hand is holding  $x$  in situation  $s$ )  
 $over(y, s)$  (the hand is over bin  $y$  in situation  $s$ )  
 $in(x, y, s)$  (object  $x$  is in the bin  $y$  in a situation  $s$ ).

- (a) Write the axioms for  $move$ ,  $drop$  and  $grab$  actions.
  - (b) Write the successor state axioms for all the *fluents*.
4. Represent the ontologies of the following worlds, and explain, how you will perform the question-answering using each of these ontology?
  - (a) Ontology of Shirt.
  - (b) Ontology of Dining table.
  - (c) Ontology of University system.

5. Given the Table  $T$ , and blocks  $A, B, C, D$ , apply the STRIPS to plan the solution of following problem:

Initial state **I** as,

$clear(A), clear(B), clear(C), clear(D),$   
 $on(A, T), on(B, T), on(C, T), on(D, T),$

i.e., the blocks  $A \dots D$  are on table, and their tops are clear.

Final State **F** :

$on(A, T), on(A, B), on(B, C), on(C, D), on(D, T), clear(A).$

Use the action  $puton(X, Y)$ , where  $X$  is a block  $A \dots D$  and  $Y$  is either table  $T$  or block  $A \dots D$ . Give the forward planning to reach state **G** starting with state **I**.