

Problem Set 3

cs112

Posted: Tuesday, November 18, 2008

Due Date: Tuesday, December 2, 2008 IN CLASS

Spatial Logic Questions

1. Describe some of the key differences between RCC8, the 4-intersection calculus, and the 9-intersection calculus. Try to be as specific as possible, but limit your answer to one page.
2. What extensions are necessary to account for a region with a hole in both the region connection calculus and the 9-intersection calculus?
3. Identify the spatial relationships in the following sentences. For each statement, you must provide two representations: (1) RCC8 and (2) the 9-intersection calculus. Make sure your answers to this problem are clearly presented as they will be used for question 4 below.
 - (a) John is leaning on the tree.
 - (b) The tree is in the middle of the park.
 - (c) The path runs along the entire perimeter of the park.
 - (d) Waltham is next to Newton.
 - (e) The park is in both Waltham and Newton.
4. In order to infer relationships in temporal logic, we developed temporal closure rules. For example, a typical closure rule would be:
 $(a < b) \wedge (b < c) \rightarrow (a < c)$, where $<$ stands for the BEFORE relation.
If we want to infer additional spatial relationships, we will need to develop spatial closure rules as well. For this problem, you must provide some of the closure rules that would be used to infer new relationships in RCC8. Use the RCC8 representations you provided in question 2 as your initial knowledge base. Provide the closure rules needed to infer the following statements. For each statement, show the derivation so it is clear how you used your closure rules to get from the initial statements to the inferred one. (Note: In order to do this, you will also have to provide the RCC8 representation for each of the statements below.)
 - (a) John is in the park.
 - (b) The path is in both Waltham and Newton.
 - (c) John is in either Waltham or Newton.
5. In the last question, you provided some closure rules for RCC8. How would you represent these rules with the 9-intersection calculus? Repeat the derivations from the above question with these new rules. Again, you will have to provide the 9-IC representation for each of the inferred statements to complete your derivation.