Principles of Knowledge Representation and Reasoning

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Exercise Sheet 10

Due: July 8, 2008

Exercise 10.1 (Composition of Allen relations, 3 marks)

Prove the following, using the definitions of the base relations of Allen's interval calculus and the definition of composition:

(a) $d \circ d = d$

(b) If the endpoints of the intervals were restricted to $\mathbb{Z}$, then $d \circ d \neq d$.

(c) $\{f, f^{-1}\} \circ \{o, m^{-1}\} = \{>, o, o{-}1, s, s^{-1}, d, d^{-1}\}$

For part (c) you may use the composition table and the distributivity of the composition over sets of relations.

Exercise 10.2 (Helly's Theorem, 4 marks)

Prove Helly's Theorem for $n = 1$. You may (and need to) use that the family of sets is finite.

Exercise 10.3 (Subclasses of Allen's interval calculus, 3 marks)

(a) State a relation in Allen's interval calculus that is contained in subclass $\mathcal{P}$ but not in subclass $\mathcal{C}$.

You do not have to show that your relation is not contained in $\mathcal{C}$.

(b) State two relations in Allen's interval calculus that are contained in $\mathcal{H}$ but not in class $\mathcal{P}$. You do not need to prove that your relation is not contained in $\mathcal{P}$.

Do not use the examples from the lecture slides.