Homework Assignment #1

Note

This assignment is due 2:20PM Thursday, April 14, 2011. Please write or type your answers on A4 (or similar size) paper. Late submission will be penalized by 20% for each working day overdue. You may discuss the problems with others, but copying answers is strictly forbidden.

Problems

1. (60 points) Consider model checking the CTL property $\mathbf{AG}(l_0 \to \mathbf{AF}CR_0)$ (using the procedures in Chapter 4.1 of [CGP 1999]) against the following Kripke structure for a two-process mutual exclusion program. Note that we are treating the statement labels l_0 and CR_0 as atomic propositions.



(Source: redrawn from [CGP 1999, Fig 2.2])

Please illustrate the steps of labeling the states with sub-formulae during the execution of the model checking algorithm. As you will see, the property does not hold (i.e., there is possibility of starvation). What fairness constraints should be added?

(40 points) For an ordered set of your choice, find a self-map on the set (i.e., a function mapping from the set to itself) that is monotonic (order-preserving), but not ∪-continuous. Please state monotonicity and ∪-continuity precisely in terms of the chosen ordered set before presenting the example self-map.