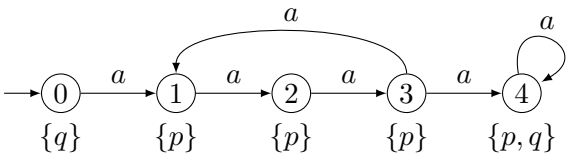
Homework Assignment #3

Note

This assignment is due 2:20PM Thursday, May 26, 2011. Please write or type your answers on A4 (or similar size) paper. You may discuss the problems with others, but copying answers is strictly forbidden.

Problems

1. (40 points) Consider an extended Kripke structure M as shown below:



   Show the iterative valuations and the final result for the following fixpoints in μ-calculus:

   (a) $\mu Q.(q \vee (p \wedge \langle a \rangle Q))$

   (b) $\mu Q_1.(\nu Q_2.(p \wedge \langle a \rangle Q_2) \vee (q \wedge \langle a \rangle Q_1))$

2. (20 points) Define a Büchi automaton (by drawing its transition diagram) for each of the following temporal properties.

   (a) p holds initially (at 0-th position) and at every third position.

   (b) Whenever p holds, q must hold eventually at a strictly later position.

3. (40 points) Apply the simple on-the-fly translation algorithm to construct a generalized Büchi automaton from the LTL formula $(p \wedge q)\, \mathcal{U}\, (p \vee q)$. Please try to illustrate how the algorithm works by showing a few partially constructed automata during the translation.