University of Washington
Department of Computer Science and Engineering
CSE 311, Autumn 2012

November 22, 2012

Homework 9, Due Friday, November 30th, 2012

Problem 1:

a.1) Give a three state DFA with state names a, b, and c to recognize the set of binary strings that have two consecutive 1's.

a.2) Give a three state DFA with state names 0, 1, and 2 to recognize the set of binary strings that have two consecutive 0's.

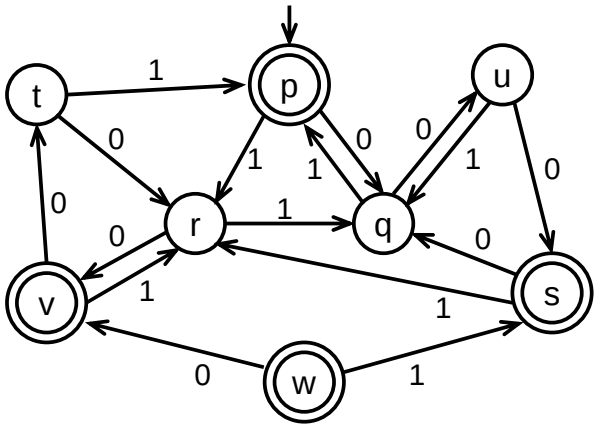
b) Use the above DFAs and the "product" construction for checking two properties at once to build a DFA with state names from $\{a, b, c\} \times \{0, 1, 2\}$ that recognizes strings that have two consecutive 1's and two consecutive 0's. (There are more efficient DFAs to recognize this set but just use the construction without optimizing it.)

Problem 2:

Design a finite state machine with outputs for a Candy Machine that dispenses a Gumball for 10 cents or M&M's for 15 cents. The machine takes nickels and dimes. It returns change if too much money is inserted or if the cost of the item selected is less than the amount of money deposited. A state is allowed to have multiple outputs.

Problem 3:

Apply the state minimization algorithm from the lectures to the DFA below. Write out the groups of states that you begin with as a sequence of sets of states. At each step, say which symbol and which group of states you are considering and how this splits the groups of states. Show how all the states are grouped after each step. When you have finished, draw the diagram for the resulting minimized DFA.



Problem 4:

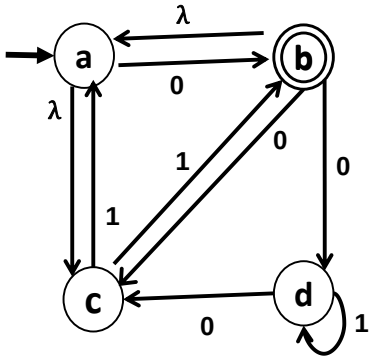
Draw NFAs that recognize the languages described by each of the following regular expressions. Use the construction given in class or in the book or produce something simpler if you can.

a) $((01)^*1)^* \cup 11^*$

b) $(0 \cup 0^*1)^* \cup (1 \cup 1^*0)^*$

Problem 5:

Apply the construction given in lecture to convert the NFA below to a DFA that recognizes exactly the same language.



Problem 6:

Prove that the set of all binary strings with more 0's than 1's is not recognized by any DFA.