CMPS 282: Software Engineering II
Department of Computer Science
Problem Set 2

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Due: Tuesday April 15

The topic of this problem set is writing I/O Automata.

1 (20 points).

(a) **(10 points)** Give an I/O automaton A such that:

1. A has a single start state.
2. A has two output actions x, y.
3. A has no states without an outgoing transition, i.e., from every state, either x or y or both can be executed.
4. In any finite execution of A, the number of occurrences of x and the number of occurrences of y differ by at most 1.

(b) **(10 points)** Now modify the I/O automaton for (a) so that the number of occurrences of x and the number of occurrences of y differ by at most n, where n is some constant.

2 (15 points). Give an I/O automaton A such that:

1. A has a single start state
2. A has no states without an outgoing transition, i.e., from every state, at least one action can be executed
3. A has one input action x and one output action y
4. In any infinite execution of A, every occurrence of x is eventually followed by an occurrence of y (hint: recall that I/O automata are *input-enabled*, so in this case, the input x must be executable from every state of A).

3 (15 points). Give an I/O automaton A such that:

1. A has a single start state.
2. A has no states without an outgoing transition, i.e., from every state, at least one action can be executed.
3. A has one input action b and two output actions a, x.
4. In any execution α of A, if a is executed as some point, then x is not executed unless b is first executed. In other words, every "interval" in α from some occurrence of a until the first subsequent occurrence of b, does not contain any occurrence of x.