Informatics 1 - Computation & Logic: Tutorial 6

Computation: Non-deterministic FSMs and FSM composition

Week 8: 4-8 November 2013

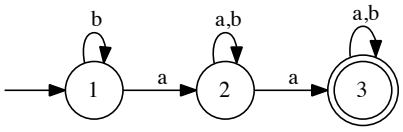
Please attempt the entire worksheet in advance of the tutorial, and bring with you all work, including (if a computer is involved) print-outs of code and test results. Tutorials cannot function properly unless you do the work in advance.

You may work with others, but you must understand the work; you can't phone a friend during the exam.

Assessment is formative, meaning that marks from coursework do not contribute to the final mark. But coursework is not optional. If you do not do the coursework you are unlikely to pass the exams.

Attendance at tutorials is **obligatory**; please let your tutor know if you cannot attend.

1. Consider the Finite State Machine in the diagram:



(a) Draw its transition table:

(b) Is it a deterministic or non-deterministic FSM (N-FSM)? Why?

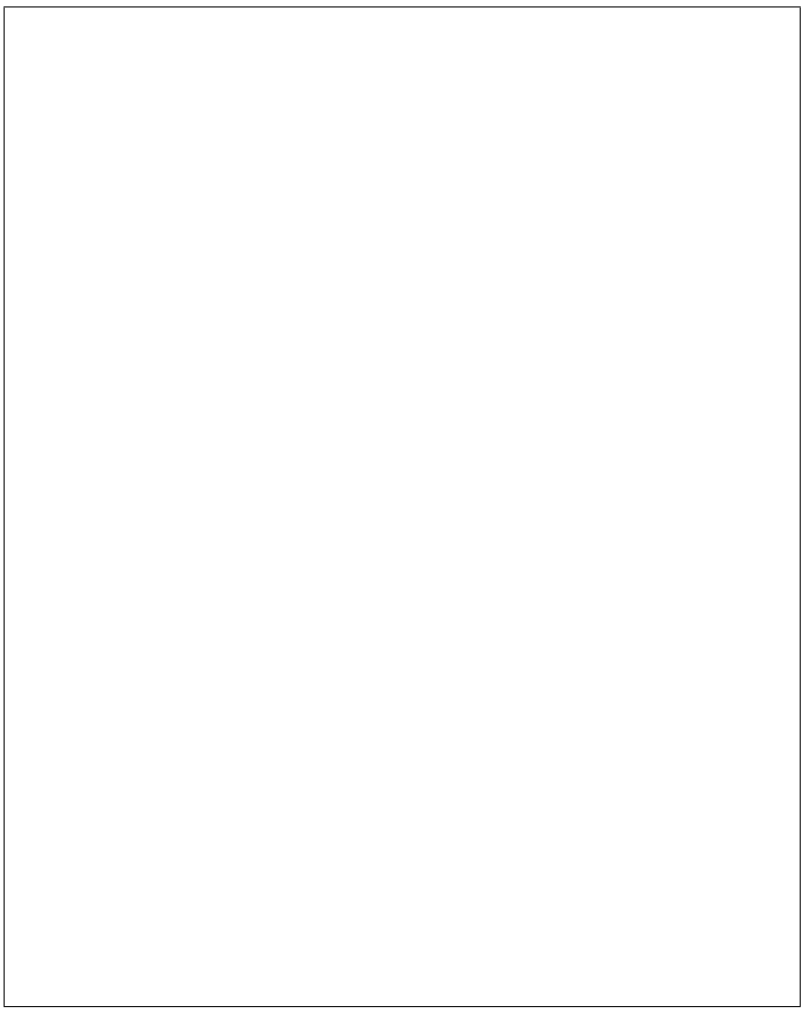
2. Sometimes it is useful to combine simple FSMs to obtain one that can accept more complex languages. Take the following language:

$$(ab^*a|aa^*b)ba^*$$

(a) What is the meaning in words of the formula?

(b) Draw the simple FSMs that accept the subparts of the formula:

(c) Compose them to obtain an N-FSM able to accept the language in the formula:



3. Draw a finite state acceptor which accepts an infinite set of strings each of which consists of an *odd number of* 0*s* and an *even number of* 1*s greater than* 0. To be more precise, if string s is accepted by the machine, then s must:

   (a) consists of an odd number of symbols;

   (b) contain only 0s and 1s;

   (c) contain an odd number of 0s; and,

   (d) contain an even number of 1s greater than 0.

   To create such acceptor, first create an acceptor for the even number of 1s, then another acceptor for the odd numbers of 0s, and then put the two acceptors together using the correct operator. Motivate your choice of the operator.

4. (a) Do D-FSMs and N-FSMs recognise the same languages?

(b) What advantages do N-FSMs have over D-FSMs, and vice-versa?

This tutorial exercise sheet was written by Paolo Besana, and extended by Thomas French and Areti Manataki. Send comments to A.Manataki@ed.ac.uk