Informatics 1 - Computation & Logic: Tutorial 5

Computation: Introduction to Finite State Machines

Week 7: 28 October - 1 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 following Finite State Machine (FSM) over the (input) alphabet $\{0, 1\}$:

   There are just two states, called state A and state B. State A is the initial state. State A is the only accept state. There are transitions labelled '0' from state A to itself and from state B to itself. There are transitions labelled '1' from state A to state B and from state B to state A.

   Draw this machine.

2. Which of the following strings are accepted by this machine? (Y/N)

ϵ	
0	
1	
00	
01	
10	
11	
101	
010	
0011	
1011	
1010	
10001	
11011000101	

3. What property is shared by all the strings which are accepted by this machine?

4. Does the machine accept all strings with this property?

5. What do the two states 'mean'?

6. Fill out the following table so that the entry in row x column y contains the names of all states that can be reached from state x by a transition labelled y in the above machine:

	0	1
state A		
state B		

Use the table to decide whether or not the machine is deterministic, and explain why.

7. Consider the following FSM over alphabet $\{0, 1\}$:

   There are just three states — state A, state B and state C. State A is the initial state. State C is the only accept state. There are transitions labelled 0 *from state A to state B, from state B to state C, and from state C to itself. There are transitions labelled* 1 *from state A to itself, from state B to state A, and from state C to itself.*

   Draw this machine.

8. What language is defined by this machine? (Think about what the states 'mean'.)

9. Fill out its transition table:

	0	1
state A		
state B		
state C		

Is the machine deterministic? Why?

10. Draw a finite state machine over alphabet $\{0, 1\}$ which accepts all and only those strings of which the string 101 is a substring.

11. Draw a finite state machine over alphabet $\{0, 1\}$ which accepts all and only those strings consisting of a specified number of 0's followed by *exactly the same* number of 1's?

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