Formal Models SS 2016: Assignment 1

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Exercise 1 Specify an automaton over the alphabet {a, b, c} which accepts the words of the language with the following properties:
(1) a word starts with at most two *a*
(2) a *c* is always followed by an even number of *b* (0 is even)
(3) each word has at least size 1
(4) there are no other restrictions on the words

Examples: *aa*, *baa*, *aacbbaacbbcbbbb*, ...

1. Graphically specify the automaton which accepts exactly the words described above.
2. Is the automaton deterministic?
3. Is the automaton complete?
4. Formally specify the automaton as a 5-tuple, including all of its components.

Exercise 2

Specify an automaton which describes the (simplified) structure of valid method signatures in Java-like programming languages according to following specification:

1. optional modifier `public`, `private`, `protected`
2. return type `void` or data type
3. method name
4. parameter list in brackets which can either be empty or which can contain multiple "data-type parameter-name"-pairs separated by a comma.

For simplification, we consider only data types `Object`, `int`, and `boolean`. Method names and parameter names are strings consisting of letters a, b, c and numbers 1, 2. The first symbol of a name is a name is a letter. White spaces do not have to be considered.

Examples:

- `public void abc1 (Object a, boolean b)`
- `Object bb ()`

Exercise 3

Draw an FA A with input-alphabet $\Sigma := \{a, b\}$ having *exactly* 3 states such that...

1. ...A is non-deterministic and incomplete.
2. ...A is deterministic and incomplete.
3. ...A is non-deterministic and complete.
4. ...A is deterministic and complete.

Justify each of your solutions.

Exercise 4

Let $P_3 := A_3 \times A_4$ be the product automaton of FA A_3 and FA A_4 as shown on the right. Draw P_3 and fully specify it formally as a 5-tuple. Find three words w with $w \in L(P_3)$. What is the maximum number of states P_3 can have in theory? Justify your answers.