Computer Science 162 Practice for Final Exam

April 9, 2018

1. For each regular expression given below, give a DFA that accepts the language so described. When possible, find a NFA that is smaller than the DFA for the same language.

   (a) $a^*b^*a^+$

   (b) $(aa + b)^*(b + a)$

   (c) $(a + b)^*cccb^*$

   (d) $((0 + 1)(0 + 1))^*$

2. Use non-determinism in an NFA that accepts the following language: $\{w \in \{a, b, c\}^* |$ w has an even number of as or contains cca as a substring (or both)$\}$.

3. For each of the string descriptions below, give a regular expression for the language of such strings. Assume the alphabet is $\{a, b, c\}$ unless otherwise stated.

   (a) All strings that contain baab or baaab as a substring.

   (b) Strings where no b is followed by a.

   (c) Strings over $\{a, b, c\}$ that have at least three cs.

   (d) Strings that have no three cs in a row – that is, do not have ccc as a substring.

   (e) Strings that have no cs and an odd number of as.

   (f) The strings over $\{a, b\}$ accepted by the DFA that has states $q1$, $q2$, and $q3$, where $q1$ is the start state, and where the set of accept states is $\{q3\}$, and where the transition function is the following:

state	input	destination state
$q1$	a	$q1$
$q1$	b	$q2$
$q2$	a	$q1$
$q2$	b	$q3$
$q3$	a	$q1$
$q3$	b	$q3$