CS 131 Compilers: Discussion 3: Top-Down Parsers

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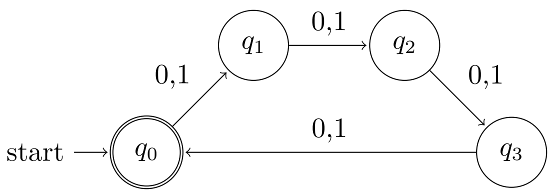
1 DFA and NFA

1.1 Introduction

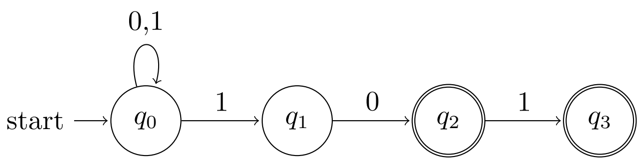
Finite state automata (FSA) are abstract machines that feature states and guarded tran-sitions from one state to another. An FSA can only be in one state a time, and its totalnumber of states isfinite. The machine takes transitions in response to inputs it receivessequentially; if an input matches the guard of a transition that departs from the currentstate that transition is said to beenabled; only enabled transitions can be taken. FSA thathave an accepting state provide the machinery to determine whether an input string is in aregular language. If no transitions are enabled by a given input then the entire input stringgets rejected. If all inputs are processed and the FSA is in an accepting state then theentire input string is accepted. Deterministic finite state automata (DFA) can only haveone enabled transition at a time while a non-deterministic finite state automata (NFA) canhave multiple.

1.2 What language is accepted by the following DFA?



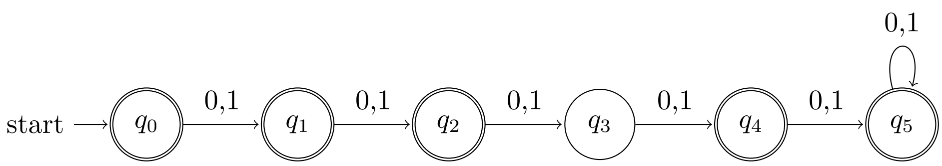
Answer:

1.3 What language is accepted by the following NFA?



Answer:

1.4 What language is accepted by the following NFA?



Answer:

1.5 Construct the NFA that accepts

1.5.1 $x(zy?|(yz)*)$

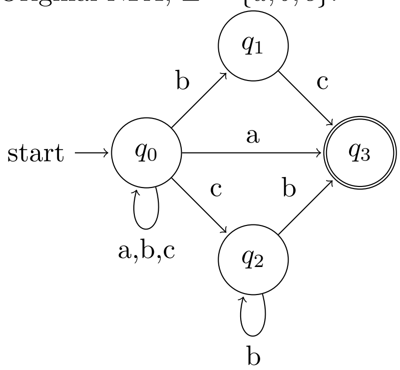
Answer:

1.5.2 $(10) * 1 * 01 * 0$

Answer:

1.6 Minimized the NFA

1. Original NFA, $\Sigma = \{a, b, c\}$:



Answer:

2 Pumpingg Lemma

Pumping Lemma: For any DFA (or NFA or regular expression) that accepts an infinite number of strings, there is some minimum length, M, such that any string with length greater than or equal to M that the machine accepts must have the form uxv, where u, x, and v are strings, x is not empty, the length of ux is $\leq M$, and the machine accepts all strings of the form ux^nv, for all $n \geq 0$.

2.1 Proof of not regular

Let $A = \{1^j z \mid z \in \{0,1\}^*$ and z contains at most j i's, for any $j \geq 1\}$. Prove, by the pumping lemma, that A is not regular.
Answer:

http://pfmiles.github.io/blog/left-recursion-removal-using-kleene-closure/