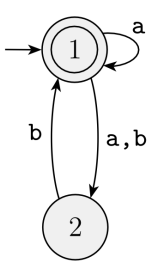
Scientific Computing (MATH6183001)

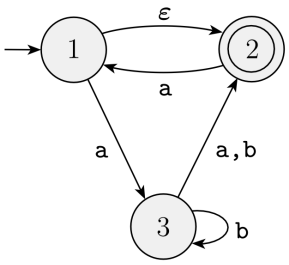
Problem Set 3 - Nondeterministic Finite Automata

July 16, 2024

Problem 1. 1) Convert the following two NFAs to equivalent DFAs. 2) Give the formal definitions for the given NFAs.



(a)



(b)

Problem 2. Give state diagrams of NFAs with the specified number of states recognizing each of the following languages. In all parts, the alphabet is {0,1}.
1) The language {0} with two states.
2) The language {w | w contains the substring 0101} with five states.
3) The language {w | w contains an even number of 0s, or contains exactly two 1s} with six states.

Problem 3. Give the state diagrams of NFAs recognizing the union of the languages described in :
1) {w | w begins with a 1 and ends with a 0} and {w | w contains at least three 1s}.
2) {w | w contains the substring 0101} and {w | w doesn't contain the substring 110}.

Problem 4. Give the state diagrams of NFAs recognizing the concatenation of the languages described in
1) {w | the length of w is at most 5} and {w | every odd position of w is a 1}.
2) {w | w contains at least three 1s} and the empty set.

Problem 5. Use the construction in the proof of Theorem 1.49 to give the state diagrams of NFAs recognizing the star of the languages described in
1) {w | w contains at least three 1s}.
2) {w | w contains at least two 0s and at most one 1}.
3) {ϵ, 0}.