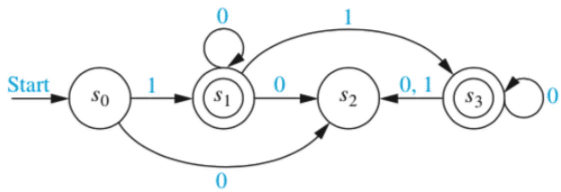
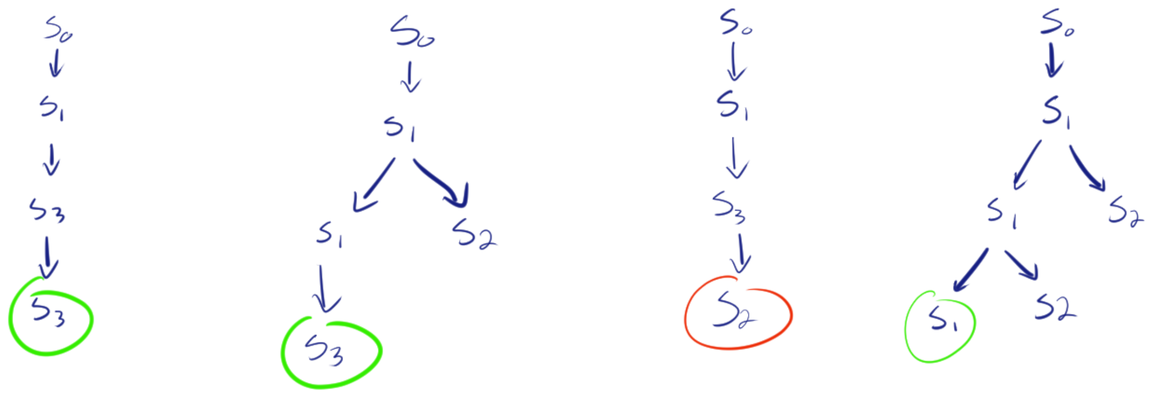
CSC 404 - Activity/Project 3 - Name: Chris Glanzer

Problem 1. Consider the following nondeterministic finite automaton (NFA) :



a. By drawing the 'tree of possibilities' (independent 'processes' or 'threads'), determine if the following bit strings/words are accepted or rejected by the machine.

$w_1 = 110$ $\quad$ $w_2 = 101$ $\quad$ $w_3 = 111$ $\quad$ $w_4 = 100$

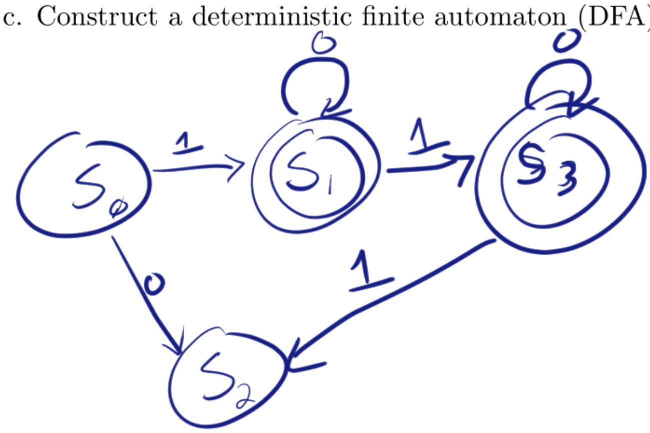


b. Determine the language recognized by the NFA. You can write this out in 'words' or you can have a stab at writing it with fancy regular expressions (more about these soon!)

1|10...|11|10...1|10...10...

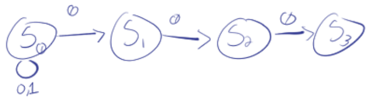
✓ ✓ ✓ ✓

c. Construct a deterministic finite automaton (DFA) that recognizes the same language as the NFA.

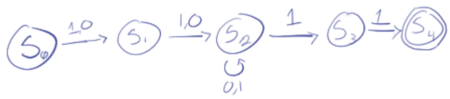


Problem 2. In what follows, try to take advantage of nondeterminism as much as possible.

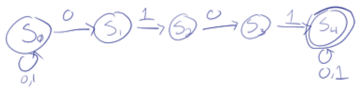
a. Construct a nondeterministic finite-state automaton that recognizes the set of all bit strings that contain three 0s.



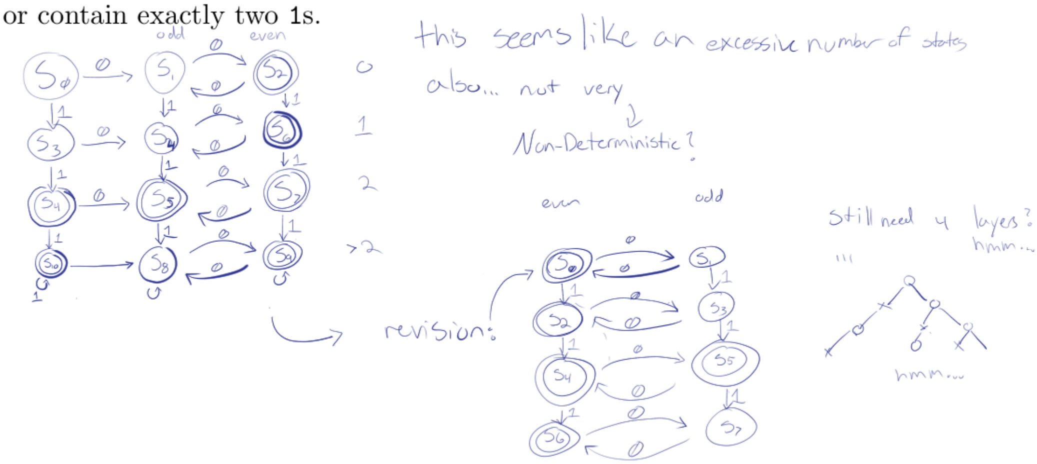
b. Construct a nondeterministic finite-state automaton that recognizes the set of all bit strings of at least 4 characters that begin and end with 11.



c. Construct a nondeterministic finite-state automaton that recognizes the set of all bit strings that contain the substring 0101 (i.e., w = x0101y for some x and y). Use at most 5 states.



d. Construct a nondeterministic finite-state automaton that recognizes the set of all bit strings that contain an even number of 0s or contain exactly two 1s.



e. Construct a nondeterministic finite-state automaton that recognizes the set of strings over the alphabet $\{a, b, c, d\}$ such that the final character has appeared before. For example,

abca, bcdaa, dad, bbb are accepted and abc, cba, adc are rejected.