

Homework Sheet 2

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Problem 3

(1.)

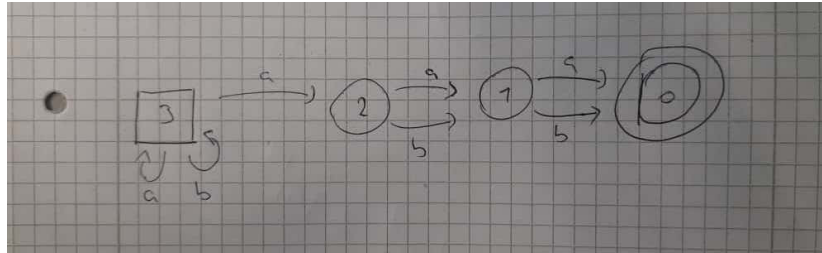


Figure 1: nfa

So in this NFA we can have arbitrarily many a's and b's before the third last a, then we have to read an a, then we can read an a or b, then we can read an a or b and then we reach the final state. I named the states as 0, 1, 2, 3. They are just dummy names. Here 3 is the starting state and 0 is the final state.

(2.)

(please look at figure 2. for some reason the image goes to the end of the paper :)) This is the DFA version of the NFA above. The state names in DFA correspond to the NFA states they contain. The state $\{3\}$ is the starting state and the states $\{0, 3\}$, $\{0, 2, 3\}$, $\{0, 1, 3\}$, $\{0, 1, 2, 3\}$ are the final states. I constructed this DFA from the NFA above using the strategy we learned in the lecture.

(3.)

We can see the NFA in two parts the starting state and the chain of states after that (the last node of the chain being the final state). If we were to change 3rd last to kth last then in the chain part of the NFA we would simply have k states instead of 3 states. And from the NFA we would reconstruct the DFA.

Problem 4

(please look at figure 3. for some reason the image goes to the end of the paper :))

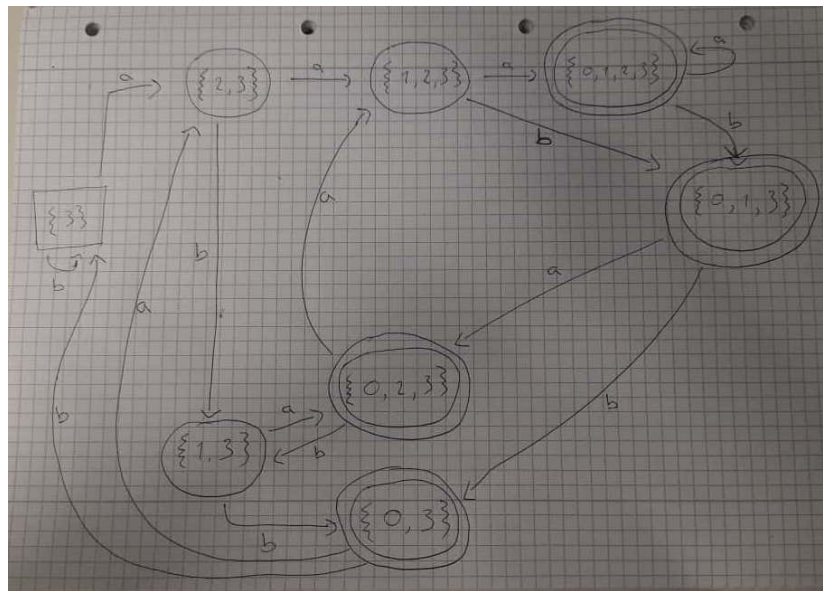


Figure 2: dfa

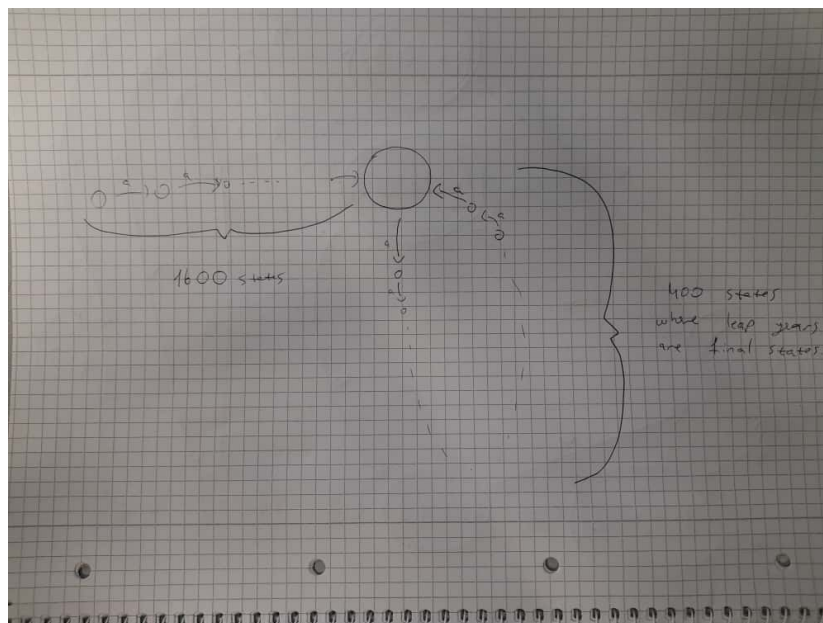


Figure 3: leap year dfa

We can design a DFA with 2000 states. The first 1600 states will be just a chain of states from 0 to 1599. After that we have a looping 400 states where leap years are final states. The chain part is for "> 1600" condition in the question. And the looping 400 states part is for detecting the leap years.