Tutorial: DFA, NFA.

What we were calling a FA will now be called a

DFA - Deterministic Finite Automaton.

- exactly one transition can be made at each point in the computation, while ∃ input to be processed.

Excercises and Homework and Assignments.

Excercises - pointers to problems (usually in the text) that you can work on to learn the material

Homework - problems I assign you, NOT for handing in. I expect you ask questions if you run into difficulties.

Assignment - problems for you to do and for you to hand in - marked results will contribute to your grade

However - I will typically assign about 4 questions and mark about 2.

Excercises: Last week we did 2.1

This week, do 2.2 and 2.3

Defn: For $x, w \in \Sigma^*$, x is a substring of w if $\exists\, u, y \in \Sigma^*$ such that $uxy = w$

E.g. $abcab = w$

Then ab is a substring of w

So is bca

So is $abcab$

So is ε.

"prefix"

"suffix"

How to devise substring detector DFA s.

Let $\Sigma = \{a, b\}$ for the FA's here, unless o.w. stated.

1. has "a" as a substring

2. has "ab" as a substring

3. has "aabb" as a substring

4. has "abaab" as a substring

5. has "abababb" as a substring.

How to convert a DFA that recognizes L into one that recognizes $\overline{L}$.

"contains aab as a substring"

"does not contain aab as a substring".

Problems for us to work on today: 2.1 in text.
Some more, if we have time:

Assume $\Sigma = \{a, b\}$. Give DFAs.

1. $\{w \mid w$ does not contain exactly two a's $\}$

2. $\{w \mid w$ ends in ab or in ba $\}$.

3. $\{w \mid$ every odd position is an a $\}$

4. $\{w \mid w$ contains at least 3 a's $\}$

Give NFAs of the following size: $\Sigma = \{0, 1\}$

5. $\{w \mid w$ ends in 011 $\}$, 4 states.

6. $\{\varepsilon\}$, 1 state.

7. Give a NFA or DFA for:

$\{ w \in \{0,1\}^* \mid |w| \equiv 2 \bmod 3$ and 2nd last symbol is $0\}$

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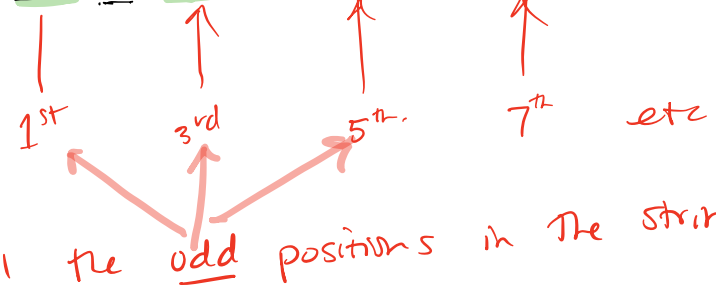
1. "not exactly 2 a's", $\Sigma = \{a, b\}$

2. "ends in ab or ba" $\Sigma = \{a, b\}$

3. a b a a a b a ...



All the odd positions in the string must be "a"

Note - only applies to existing positions

ε has no odd positions, so all its odd positions are "a"

4. $\{ w \in \{a,b\}^* \mid w \text{ contains} \geq 3 \text{ a's} \}$

5. NFA for $\{ w \in \{0,1\}^* \mid w \text{ ends in } 00 \}$,

3 states:

6. $\{\varepsilon\}$, 1 state NFA:

Note: This is also a DFA under our convention that missing transitions go to dead state