

CSE 105

THEORY OF COMPUTATION

"Winter" 2018

<http://cseweb.ucsd.edu/classes/wi18/cse105-ab/>

Today's learning goals

Sipser Section 1.3

- Convert between regular expressions and automata

DFA equiv NFA equiv RegExp

Theorem: For each language L ,

L is recognizable by some DFA

iff

L is recognizable by some NFA

iff

L is describable by some regular expression

From RegExp to DFA

Structural induction!

- Build DFAs corresponding to base cases in inductive definitions of regular expressions.
- Describe constructions for DFAs corresponding to each of the inductive steps: union, concatenation, Kleene star.

Example

$a^*(ab)^*$

Example

$a^* \cup b^*$

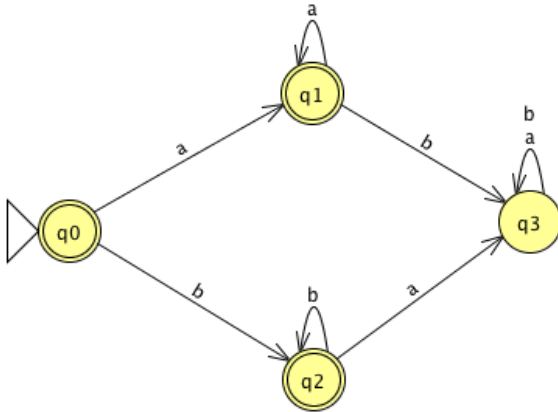
From DFA to RegExp

Trace possible paths from start state to accept state.

Intermediate machines can have regular expressions on transitions.

First:

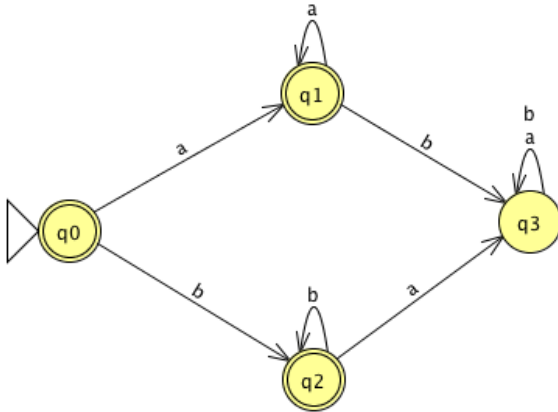
1. add new start state that has ϵ arrow **to** old start state; \emptyset arrow to all other states.
2. add new accept state that has ϵ arrows **from** old accept states.



From DFA to RegExp

Remove one state at a time.

- Restore automaton by modifying regular expressions on transitions that went through removed state.



For next time

- Work on Group Homework 2 **due Saturday**

Pre class-reading for Friday: page 77.