Today's learning goals

• 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

\( a^* U b^* \)
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; φ 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.