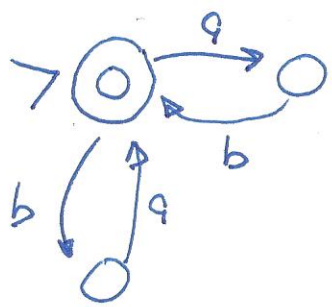
Finite Automata

CS712

Dept. of Computer Science
Univ. of New Hampshire

example



> the initial state

◎ a final state

accept start in initial state,
"consume" the string one symbol
at a time by traversing an arc
from the current state labelled
with the symbol, and when
string is fully consumed you
are in a final state.

reject end in a non-final state

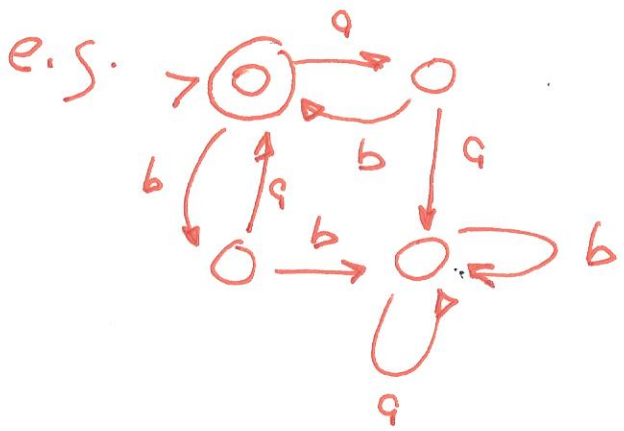
The language of a finite automaton is the set of strings it accepts.

deterministic finite automaton (DFA)

each state has exactly one src leaving it
for each alphabet symbol

note usually don't draw "error" srcs
they all go to a single, non-final
"sink" state

e.g.



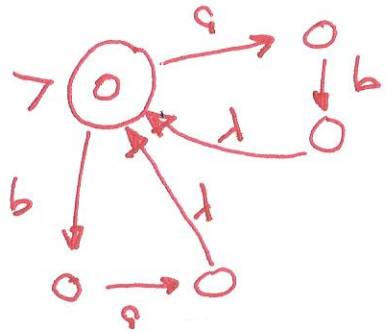
nondeterministic Finite automaton (NFA)

a state may have more than one arc labelled with the same symbol leaving it

an arc can be labelled with λ

→ i.e. no input consumed when arc is traversed

ex

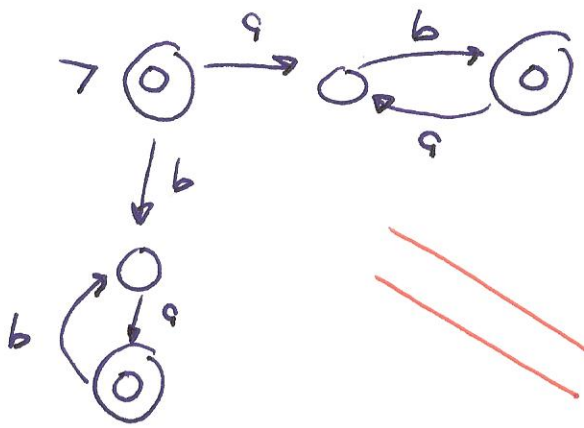


an NFA accepts a string w if there is a path from the initial state to some final state such that w is the concatenation of the symbols on the arcs of the path.

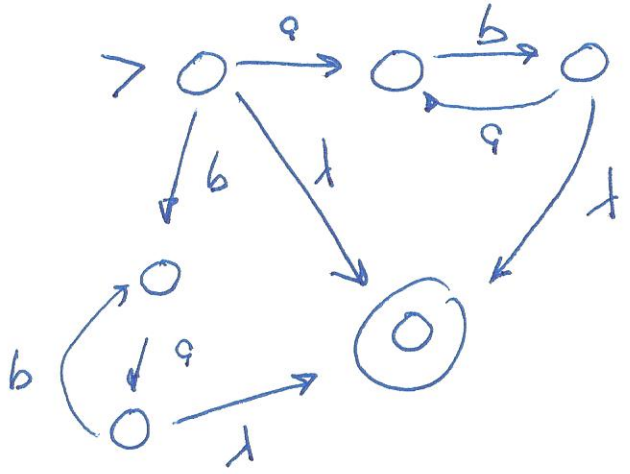
otherwise the NFA rejects the string.

All NFAs with more than one final state can be transformed to equivalent NFAs with a single final state.

ex



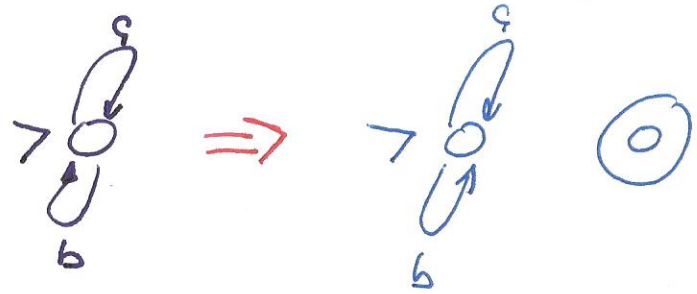
$((ab)^*) \mid ((ba)^*)$



All NFAs with no final states can be transformed to equivalent NFAs with a single final state.

Let M be:

$A = \{a, b\}$



i.e. no arcs to the final state

$L(M) = \phi$

All NFAs with an initial state that is also a final state can be transformed to equivalent NFAs with initial states that are not final states.