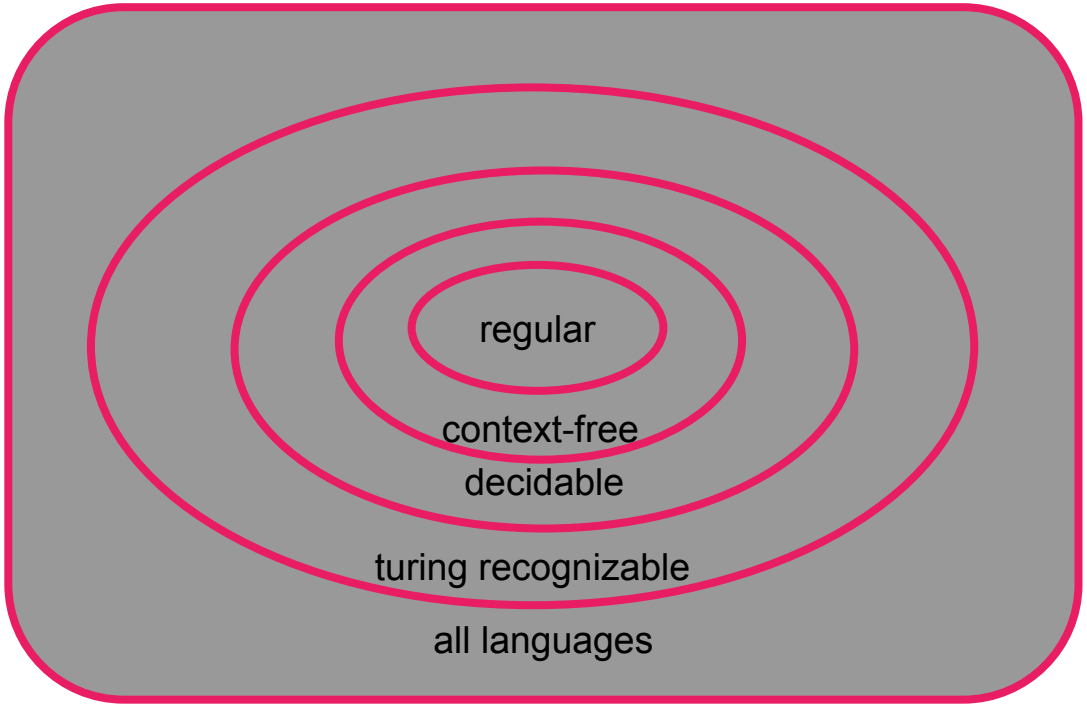
turing machines

cmsc 141
2nd semester, 2016-2017

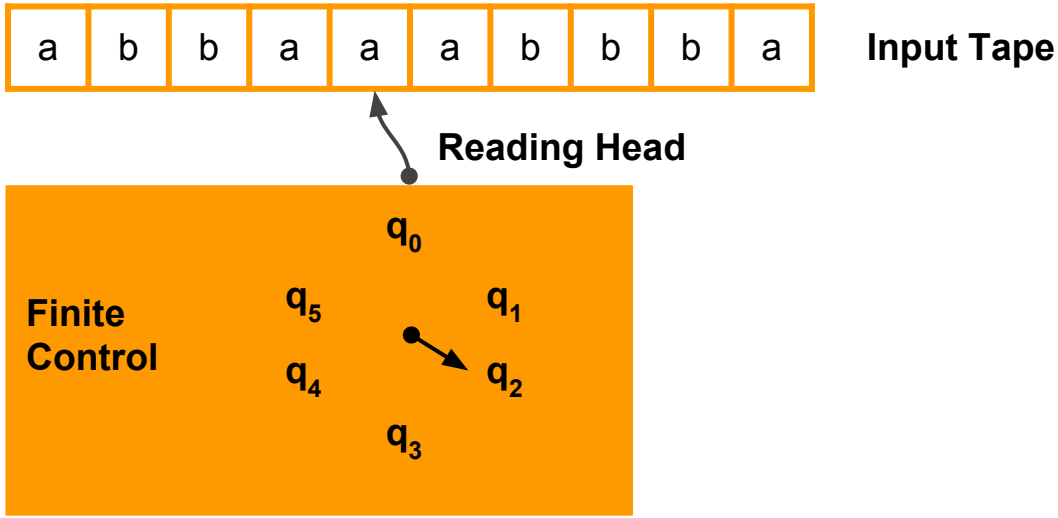
turing machine

- regular languages
  - finite automaton
  - regular expression
- context-free languages
  - pushdown automaton
  - context-free grammar
- decidable languages
- turing recognizable languages



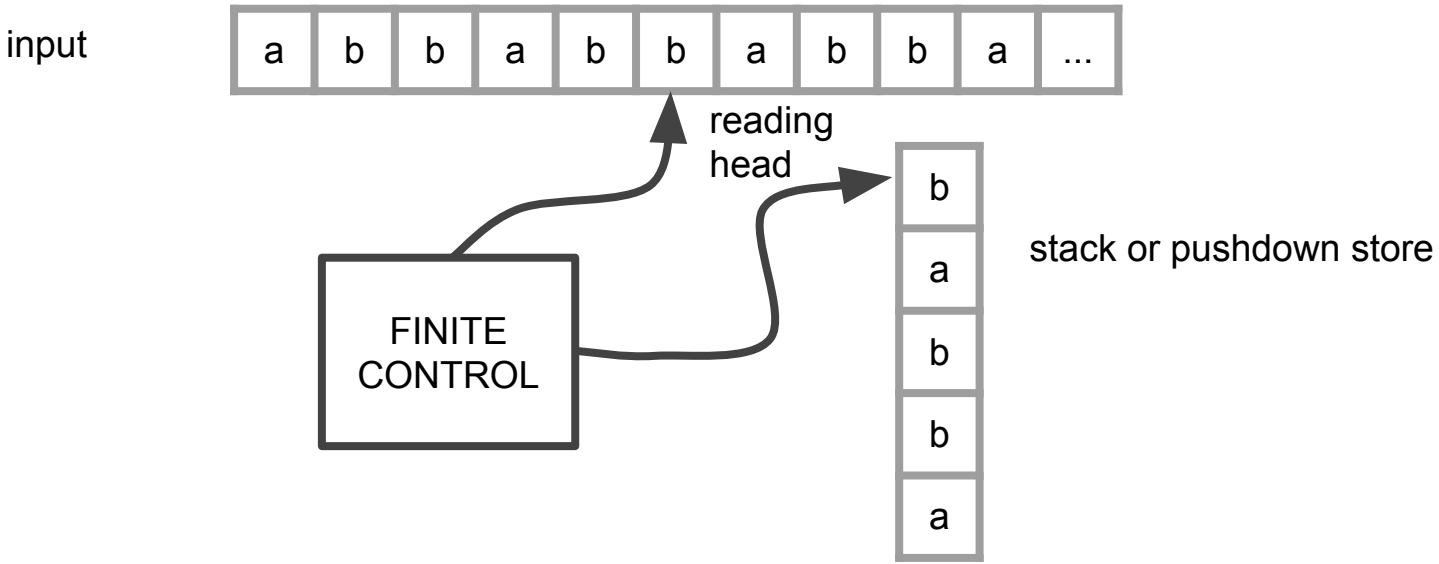
turing machine

- recall finite automaton



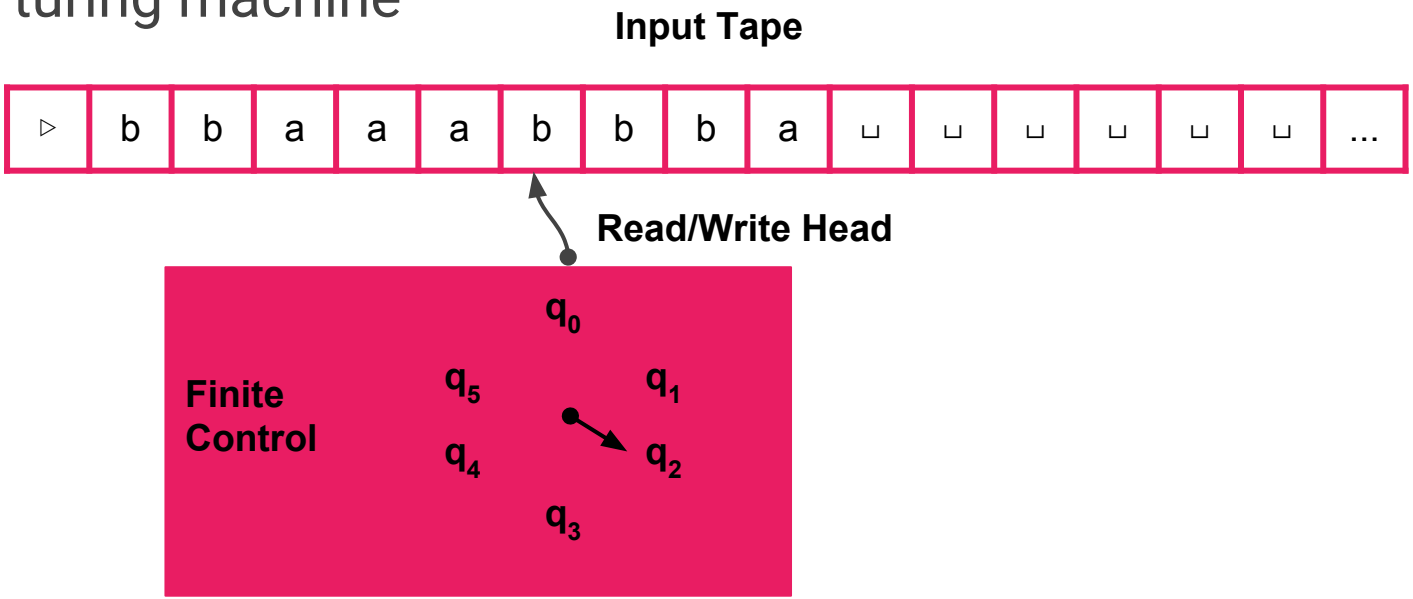
turing machine

- recall pushdown automaton



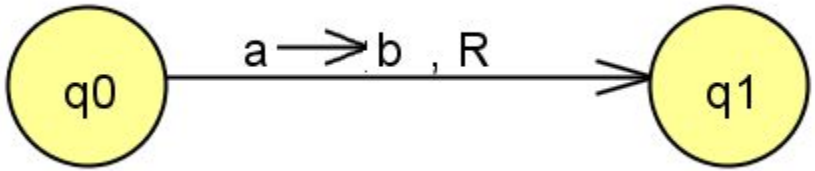
turing machine

- turing machine



turing machine

- operation
  - read current symbol
  - update the cell read
  - move one cell either to the left or right



turing machine

- formal definition
  - A turing machine is a quintuple (K, Σ, □, s, H)
    - K is the set of states
    - Σ is the alphabet
    - s is the initial state
    - H ⊆ K, halting states
      - accept state
      - reject state
    - □ is a transition function (K - H) x Σ to K x Σ x {L, R}

turing machine

- samples
  - L(ab*a)
  - $L(a^n b^n)$, $n \geq 0$
  - $L(a^n b^n c^n)$, $n \geq 0$
  - $L = \{w\#w, w \in \{a,b,c\}^*\}$
  - computes x*y