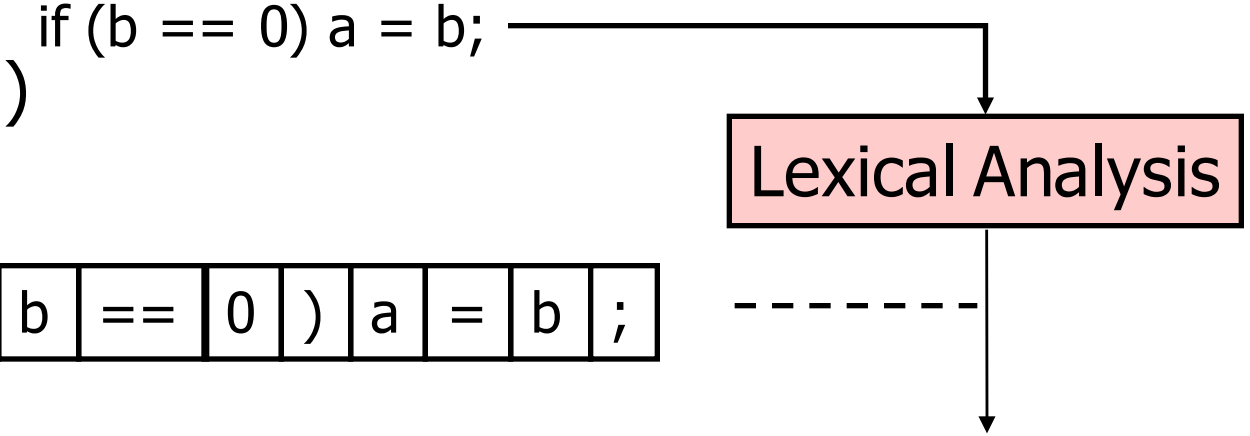
Lexical Analysis

Source code (character stream)



- Identifiers: `x  y11  elsen  _i00`
- Integers: `2  1000  -500  5L`
- Floating point: `2.0  .02  1.  1e5  0.e-10`
- Strings: `“x”  “He said, \“moo?\””`
- Comments: `/** don’t change this **/`
- Keywords: `if  else  while  break`
- Symbols: `+  *  {  }  ++  <  <<  [  ] >=`

Regular Expressions

- A language is a set of words: { moo, cow }, { a,b,c,d,… }
- Regular expressions describe languages

  `abab` **`a|b`** **`(a|b)*`** **`[1-9][0-9]*`** **`[a-z][a-z0-9]*`**

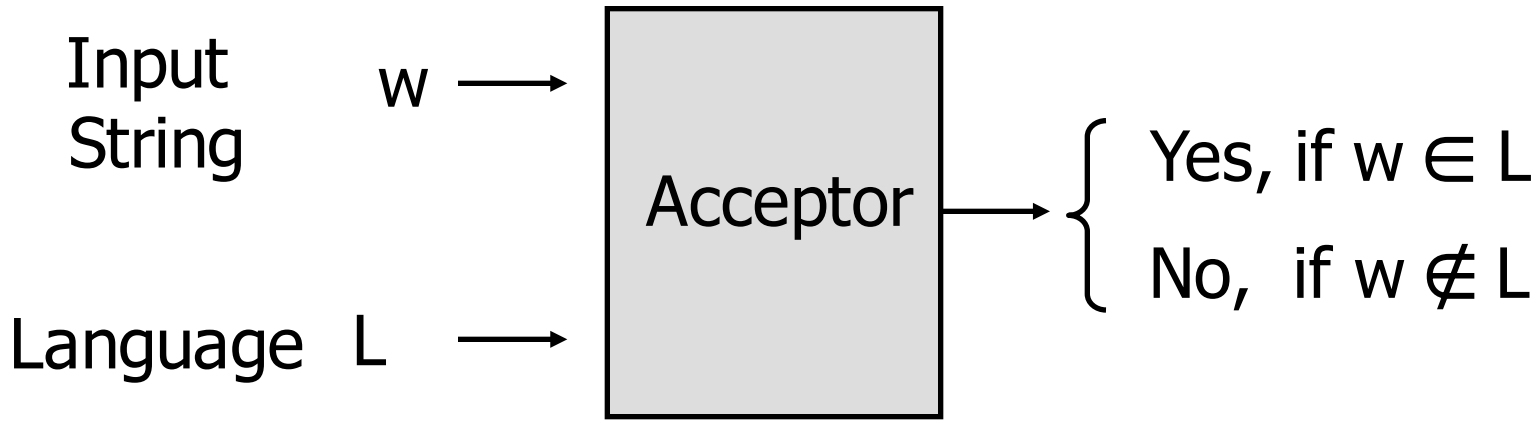
- Definition

a	ordinary character stands for itself
ε	the empty string
R|S	either R or S (alternation), where R,S are REs
RS	R followed by S (concatenation)
R*	R repeated 0 or more times

- L(R) = the language defined by regular expression R
  - L(**`a(moo|cow)`**) = { amoo, acow }
  - L(**`[1-9][0-9]*`**) = { 1,2,3,4,5,6,7,8,9,10,11,12,13,….}

Acceptors:
(a.k.a. recognizers)

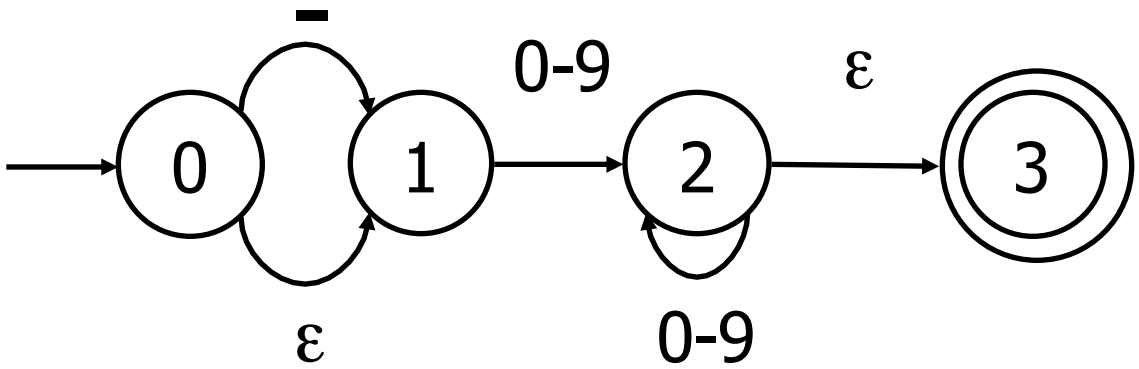
- Abstract machines that determine if an input string belongs to a language, answering Yes/No.



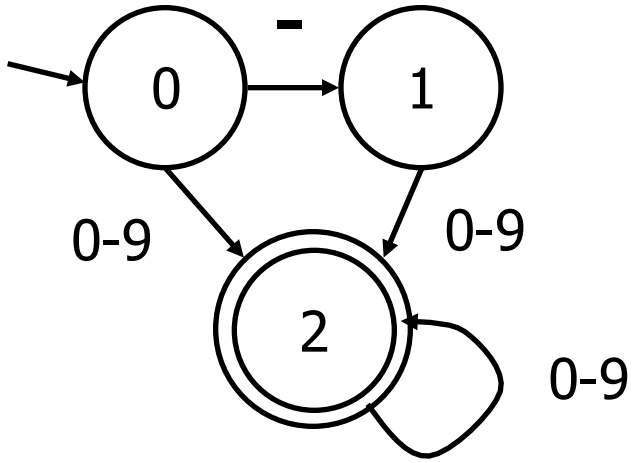
- Finite Automata:
  acceptors for languages described by regular expressions

Finite Automata

- Regular Expression: (-|ε)[0-9][0-9]*
- Non-deterministic Finite Automata:



- Deterministic Finite Automata:



Building an acceptor for a regular expression: