CS310

Finite Automata

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September 10, 2010

Quick Review

- Deterministic Finite Automata:

  5-tuple $(Q, \Sigma, \delta, q_0, F)$

  Q: finite set of states

  Σ: alphabet (finite set)

  δ : transition function ($\delta: Q \times \Sigma \rightarrow Q$)

  q_0: start state

  F : accepting states (subset of Q)

- Language A is ***regular*** if there exists a Finite Automata that recognizes A.

Regular Language

- Determinism?

- Regular language
  - Example?

  - Example of non-regular language?

Regular Operations on Languages

- Given two languages, A,B, we can create new *languages* in a variety of ways:
  - What operations have we seen?

Examples

$\Sigma=\{0,1\}$ A={w| w ends in 1}
B={w | w begins with 00}

$A \cup B =$

AB =

$A^* =$

$A \cap B =$

$\overline{A} =$

Closure of Regular Languages

- A set is ***closed*** under some operation, Examples?

- ***Regular operations***

Proof

- Theorem 1.25: The class of regular languages is closed under the union operation.

If A and B are regular languages, so is $A \cup B$

What do we need to prove?

What does regular mean?

What does it mean for $A \cup B$ to be regular?

Build the machine

$\Sigma = \{0,1\}$

A={w| w contains a 1 in the penultimate position}

A = { }

Nondeterminism

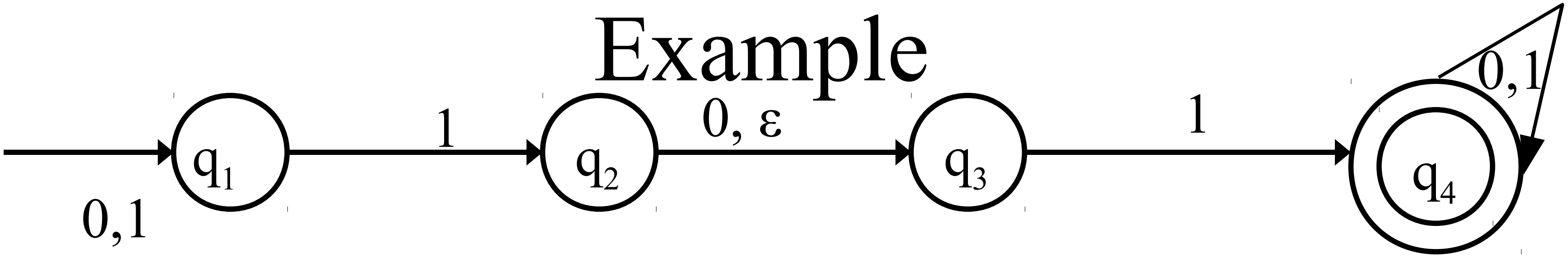
- Nondeterministic Finite Automata:

NFA

- ε transitions

- Why would we ever use this?

Example



- Does this NFA accept 010110?
- What sequence of states does it go through?

Proof

- Theorem 1.26: The class of regular languages is closed under the concatenation operation.

If A and B are regular languages, so is AB.

What do we need to prove?

What does regular mean?

What does it mean for AB to be regular?

Problems?

Examples

A = {north,south}   B= {east,west}

w = northeast is in AB

many ways to break down this string

If the AB machine breaks the string as nort and heast the string will not be accepted

A = {w | w = begins with 1 ends with 0}

B = {w | w = begins with 0 ends with 1}

w = 1000011