

CS310

Strings, String Operators, and Languages

Sections:

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Quick Review

- Sets (Union, Intersection, [Proper] Subset)
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$\{ n \mid \text{rule about } n \}$

Cross Product/Power Set

- Sequences/Tuples

- Functions

$$f : D \rightarrow R$$

- Relation

$$f : A_1 \times A_2 \times \dots \times A_n \rightarrow \{\text{TRUE}, \text{FALSE}\}$$

Equivalence Relations: 3 conditions

Strings

- Alphabet:

- String:
 - ϵ
 - length of w :
 - $|\epsilon| = \quad |w| =$
- Strings are building blocks of computer science
 - strings can represent: data sets (DNA),
 - source code, files...

String Operations

- Closure (Σ^*):
-

$$\Sigma = \{a, b\} \quad \Sigma^* = \{$$

- Concatenations

x^k is k copies of x concatenated

$$x^2 =$$

String Operations

- Prefix/Suffix
-

- Reverse

Languages

- Language
-

$$L = \{ x \in \{a,b\}^* \mid |x| \text{ is even} \}$$
$$= \{ \epsilon, aa, ab, \dots \}$$

- Complement of a language L over Σ
- Concatenation of languages

Languages

- Union of languages
-

$$L_1 = \{0\}^*$$

$$L_2 = \{1\}^*$$

what is in $L_1 \cup L_2$?

what is in L_1L_2 ?

Languages

- Kleene Star

$$L = \{ x \in \{ a, b \}^* \mid |x| \text{ is odd} \}$$

What does L contain:

{ }

$$L^* = \{ \epsilon, , , , , \}$$

Languages

- Recursive Definitions

Define L over $\Sigma = \{0,1\}$ as

1. $\epsilon \in L$

2. If $x \in L$ then $0x1 \in L$

What is in L ? $L = \{ \quad \quad \}$

- Can we prove that $\{\epsilon, 01, 0011, 000111, \dots\}$ is equivalent to $\{0^i 1^i \mid i \geq 0\}$?
- Show L is subset of $\{0^i 1^i \mid i \geq 0\}$ and the reverse

Proof

- For $x, y \in \Sigma^*$, show $(xy)^R = y^R x^R$
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