

course: [CSC 135-01 - Computing Theory and Programming Languages](#)

instructor: [Ted Krovetz](#)

related_notes: [2022-02-22](#)

Topic: Regular Expressions

W08.2 | Tuesday, February 22, 2022 | 09:01 AM

Announcements

1. Midterm [2022-02-26](#) covers though current homework
 1. Homework 01 - 03
2. Laptop midterm [2022-03-01](#)
3. Written midterm [2022-03-03](#) - Do not expect to take the whole exam
4. More info [2022-02-23](#). Q+A Thursday

Notes

Regular Expressions (RE)

Every regular expressions represents a set of strings.

All the strings share a pattern specified by the RE

- A lot of programming languages utilize regular expressions
- Used for pattern matching on strings

Regular operations on sets

- If **A** and **B** are sets of strings
 - $A + B = A \cup B = \{s \mid s \in A \text{ or } s \in B\}$
 - $AB = \{st \mid s \in A \text{ and } t \in B\}$
 - $A^* = \{x\} \cup \{s \mid s \in A\} \cup \{s_1s_2 \mid s_1, s_2 \in A\} \cup \dots$
 - x is the "empty string" length zero string

Regular Expression Definition

Every RE represents a set of strings.

RE		SET	
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RE		SET	
λ	represents	λ	Atomic RE
a	\parallel	a	Atomic RE

if R_1 and R_2 are RE representing sets **A** and **B**

RE		SET	Precedence
$R_1 + R_2$	represents	$A + B$	*
$R_1 R_2$	\parallel	AB	CONCATENATION
R_1^*	\parallel	A^*	+ (OR)

Use parentheses for graphing

Examples

What set do the following represent?

1. Turn atomic RE's into sets
2. Use set operations to convert into a single set
 1. *
 2. Concatenation
 3. + (**OR**): Breaks bigger patterns into sub-patterns

Example: $ab + ba$

1. $ab + ba$
2. $\{a\}\{b\} + \{b\}\{a\}$
3. $\{ab\} + \{ba\}$
4. $\{ab, ba\}$

Example: $a(ba)^*b$

- 1.

Example: $\{a^n \mid n \text{ is even}\}$

a^n : short hand to say a for n number of times

$\{a^n \mid n \text{ is even}\} = \lambda, aa, aaaa$

Example: $\{a^n \mid n \text{ is odd}\}$

$$\{a^n \mid n \text{ is even}\} = \{a, \text{ } aaa, \text{ } aaaaaa, \text{ } \dots\}$$