

Assignment 9

Computer Systems Lab

Assignment Date: November 19, 2020

Date of Submission: November 22, 2020

Given a context-free grammar (CFG) $G = (V, \Sigma, P, S)$ in **Chomsky Normal Form (CNF)**, and a string $w \in \Sigma^+$, write a C/C++ program that decides whether G generates w or not. You are supposed to implement **Cocke-Younger-Kasami (CKY)** algorithm. The input is as follows.

1. A positive integer m that denotes the number of variables or non-terminals. It also indicates that the names of the variables are A_0, A_1, \dots, A_{m-1} , where A_0 is the start variable.
2. A positive integer l that denotes the number of terminals. It also indicates that the names of the terminals are a_0, a_1, \dots, a_{l-1} .
3. A positive integer p that denotes the number of production rules. Each production rule is of the following form:

$$A_i \rightarrow A_j A_k, \text{ where } 0 \leq i, j, k \leq m-1, \text{ or}$$

$$A_i \rightarrow a_j, \text{ where } a_j \neq \epsilon, 0 \leq i \leq m-1, 0 \leq j \leq l-1$$

4. A string $w \in \Sigma^+$ in the form $a_i a_j a_k \dots$, where $0 \leq i, j, k \leq l-1$

Input:

4 2 8

$$A_0 \rightarrow A_1 A_2$$

$$A_0 \rightarrow A_2 A_3$$

$$A_1 \rightarrow A_2 A_1$$

$$A_1 \rightarrow a_0$$

$$A_2 \rightarrow A_3 A_3$$

$$A_2 \rightarrow a_1$$

$$A_3 \rightarrow A_1 A_2$$

$$A_3 \rightarrow a_0$$

$a_1 a_0 a_0 a_1 a_0$

Output:

$\{A_2\}$	$\{A_0, A_1\}$	ϕ	ϕ	$\{A_0, A_1, A_3\}$
	$\{A_1, A_3\}$	$\{A_2\}$	$\{A_2\}$	$\{A_0, A_1, A_3\}$
		$\{A_1, A_3\}$	$\{A_0, A_3\}$	$\{A_2\}$
			$\{A_2\}$	$\{A_0, A_1\}$
				$\{A_1, A_3\}$

Yes

Submission Instruction:

File Name: A9_RollNo.c/cpp

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