Problem

Fill out the table described in the polynomial time algorithm for context-free language recognition from Theorem 7.16 for string w = baba and CFG G:

$$S \to RT$$
$$R \to TR \mid \mathtt{a}$$
$$T \to TR \mid \mathtt{b}$$

THEOREM **7.16**

Every context-free language is a member of P.

Step-by-step solution

Step 1 of 3

Table for a string w=baba :

Specified context free grammar $(CFG)\ G$ **follows:**

$S \to RT$
$R \to TR \mid a$
$T \to TR \mid b$

Comment

Step 2 of 3

Take string $w = baba$

Now we will construct the table for string baba:

Initially the table will be as shown below:

	1	2	3	4
1				
2				
3				
4				
string	b	a	b	a

First all the substring string which are having rules of the $A \to b$ will be occupied in the location where i =j. As per the theorem.

So the table will be filled as follows:

	1	2	3	4
1	T			
2		R		
3			T	
4				R
string	b	a	b	a

Now fill the remaining entries of the table such that $i \le j$ and substring formed by one or more substring such that rule $A \to BC$.

Consider the string *ba* for its suitable replacement rule.

There is no rule for this string. So the variables of the corresponding individual strings are added to the table entry.

	1	2	3	4
1	T	R,T		
2		R		
3			T	
4				R
string	b	a	b	a

Consider the string *ab* for its suitable replacement rule.

Similarly fill the next entry in the same row with rule $S \to RT$. Since it is producing the sting *ab*.

	1	2	3	4
1	T	R,T		
2		R	S	
3			T	
4				R
string	b	a	b	a

Similarly the remaining entries of the table are filled as follows using the above 2 conditions of the algorithm as the proof for the Theorem 7.16:

	1	2	3	4
1	T	R,T		
2		R	S	
3			T	R,T
4				R
string	b	a	b	a

Comment

Step 3 of 3

Now the two diagonals are filled and using the same rules the third diagonal is also filled.

	1	2	3	4
1	T	R,T	S	
2		R	S	R,T
3			T	R,T
4				R
string	b	a	b	a

Similarly fill left over entry in the table using the conditions mentioned in the algorithm.

	1	2	3	4
1	T	R,T	S	S
2		R	S	R,T
3			T	R,T
4				R
string	b	a	b	a

Comments (5)