LENGUAJES FORMALES Y AUTOMATAS

TAREA: Lema del bombeo para lenguajes libres de contexto - **COMPROBAR a^n b^n c^n**

Universidad Nacional Autónoma de México

Facultad de Estudios Superiores Aragón

Ingeniería en Computación

Materia: Lenguaje formales y autómatas.

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Tarea: Comprobar a^n b^n c^n.

Grupo: 1507

Semestre: 2024-I

Horario: Lunes, Miércoles, Viernes - 11:30 am-12:50 pm

Fecha de entrega: 16/10/2023.

Nota: Profesor agregué hasta los ejemplos de la comprobación vistos en clases.

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Órgano oficial de información

Pumping Lemma CFL

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Lema del bombeo para Lenguajes Libres de Contexto

1.- Suponer que el lenguaje a prueba ($\to L$) es LLC
2.- $\exists\, n \mid n \in \mathbb{N}$ $\quad |w| > n$ $\quad \forall w \in L$
3.- $w \mid w = xyzuv \mid x, y, z, u, v \in \Sigma$

$$|yzu| < n \qquad |yu| \geq 1$$

4.- $\forall k \mid k \in \mathbb{N} \cup \{\emptyset\}$

$$w = xy^k z u^k v \qquad w' \in L$$

$$L = \{a^n b^n c^n \mid n \in \mathbb{N}\}$$

1.- Suponer que L sí es LLC
2.- $\exists\, n \mid n \in \mathbb{N}$ $\quad w = a^n b^n c^n$
$|w| = 3n > n$ ✓

3.- $xyzuv = w$ $\quad n = n$ $\quad |yzu| < n$ $\quad |yu| \geq 1$

① $a^n b^n c^n = w$ — Para a)
$x = a^n$
$y = b^{n-1}$
$z = \lambda$
$u = \lambda$
$v = bc^n$

$k = 1$ $\quad w = a^n b^{n-1} bc^n$ ✓ $\quad k = 0$ $\quad w' = a^n bc^n$ ✗

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② $a^n b^n c^n = w$
$x = \lambda$
$y = \lambda$
$z = \lambda$
$v = a^{n-i}$ $\quad i > 1$ $\quad i < n$
$v = a^i b^n c^n$

$k = 0$ $\quad w' = \lambda\lambda^k\lambda\, a^{k(a-i)} a^i b^n c^n$ ✗
$i < n$

$|yzu| < n$

$|yu| \geq 1$

D M A

Scribe

③ $a^n b^n c^n = w$

$x = \lambda$

$y = \lambda$

$z = a^i$

$u = a^j$

$v = a^{n-i-j} b^n c^n$

$j \geq 1$

$i + j < n$

$K = 0$

$w' = a^i a^{n-i-j} b^n c^n$

$a^{n-j} b^n c^n$ ✗

④ $a^n b^n c^n = w$

$x = \lambda$

$y = a^i$

$z = a^j$

$u = a^l$

$v = a^{n-i-j-l} b^n c^n$

$i + l \geq 1$

$i + j + l < n$

$K = 0$

$w' = \lambda a^{ki} a^j a^{li} a^{n-i-j-l} b^n c^n$

$w' = a^j a^{n-i-j-l} b^n c^n$ ✗

$w' = a^{n-i+l} b^n c^n$

$i + l = 0$

$i + l \geq 1$

⑤ $a^n b^n c^n = w$

$x = a^{n-i-j-l}$

$y = a^i$

$z = a^j$

$u = a^l$

$v = b^n c^n$

$K = 0$

$w' = a^{n-i-j-l} a^{ki} a^j a^{kl} b^n c^n$

$w' = a^{n-i-j-l} b^n c^n$

$w' = a^{n-i-j} b^n c^n$ ✗

⑥ $a^n b^n c^n = w$

$x = a^i$

$y = a^j$

$z = a^l$

$u = b^n c^n$

$v = a^{n-i-j-l}$

Para B)

$b^n c^n = b^{nk} c^{nk}$

$K = 0$

$w' = a^i a^{jk} a^l (b^n c^n)^k a^{n-i-j-l}$

$w' = a^i a^l a^{n-i+j-l}$ ✗

$w = x y^k z u^k v$

(7) $a^n b^n c^n = w$

$x = a^n$
$y = b^{n-1}$
$z = \lambda$
$u = b$
$v = b^{n-i-j} c^n$

$K = 0$
$w' = a^n (b^{n-1})^K (\lambda) (b^K) b^{n-i-j} c^n$
$w' = a^n (b^{n-1})^0 b^0 b^{n-i-j} c^n$
$w' = a^n b^{n-i-j} c^n$ X

(8) $a^n b^n c^n = w$

$x = a^n$
$y = \lambda$
$z = b^i$
$u = b^j$
$v = b^{n-i-j} c^n$

$K = 0$
$w' = a^n \lambda b^i b^{0K} b^{n-i-j} c^n$
$w' = a^n b^i b^{n-i-j} c^n$
$w' = a^n b^{n-j} c^n$ X

$i, j \geq 1$
$i + j < n$

(9) $a^n b^n c^n = w$

$x = a^n$
$y = b^{n-1}$
$z = \lambda$
$u = b$
$v = c^n$

$K = 0$

Para B)
$w' = a^n (b^{n-1})^K (\lambda) (b^K) (c^n)$
$w' = a^n c^n$
X Caso

(10) $a^n b^n c^n = w$

$x = a^n$
$y = \lambda$
$z = \lambda$
$u = b^{n-i-j}$
$v = b^{i+j} c^n$

$K = 0$

$w' = a^n (\lambda)^K (a) (b^{n-i-j})^K (b^{i+j} c^n)$
$w' = a^n b^{i+j} c^n$ X

$|yzu| < n$

$|yu| \geq 1$

D M A

Scribe

(11) $a^n b^n c^n = w$

$x = a^n$
$y = \lambda$
$z = \lambda$
$u = b^{n-i-j}$
$v = b^n c^n$

$k = 0$
$w' = a^n b^{n-i-j} b^n c^n$
$w' = a^n b^n c^n$ X

Sí, pero no cumple ✓
$|yuz| < n$ $|yu| \geq 1$

(12) $a^n b^n c^n = w$

$x = a^{n-i-j-l}$
$y = a^i$
$z = a^j$
$u = a^l$
$v = b^n c^n$

$k = 0$
$w' = a^{n-i-j-l} a^i a^j a^l b^n c^n$
$w' = a^{n-i+l} b^n c^n$ X

(13) $a^n b^n c^n$

$x = a^n$
$y = b^{n-i-j+l}$
$z = b^i$
$u = b^j$
$v = b^l c^n$

$k = 0$
$w' = a^n b^{(n-i-j+l)k} b^i b^{jk} b^n c^n$
$w' = a^n b^i b^n c^n$
$w' = a^n b^{n+i} c^n$ X

Para ©)

(14) $a^n b^n c^n$

$x = a^n b^n$
$y = c^{n-1}$
$z = c^i$
$u = \lambda$
$v = \lambda$

$k = 0$
$w' = a^n b^n c^{(n-1)k} c^i$ (λ) (λ)
$w' = a^n b^n c^i$ X

$w = x y^k z^k u v$

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$a^n b^n c^n = w$

$x = a^n b^n$
$y = c^i$
$z = c^j$
$u = c^{n-i-j}$
$v = \lambda$

$k = 0$

$w' = a^n b^n \cancel{c^{ik} c^{jk} c^{(n-i-j)k}}$ (3)
$w' = a^n b^n c^j$ ✗

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$a^n b^n c^n = w$

$x = a^n b^n$
$y = c^{n-i}$
$z = c$
$u = \lambda$
$v = \lambda$

$k = 0$

$w' = a^n b^n \cancel{c^{(n-i)k}} c$ $\cancel{(\lambda)(\lambda)}$
$w' = a^n b^n c$ ✗

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$a^n b^n c^n = w$

$x = a^n b^n$
$y = c^i$
$z = c^j$
$u = c^k$
$v = c^{n-i-j-k}$

$k = 0$
$w' = a^n b^n \cancel{c^{ik}} \cancel{c^{jk}} \cancel{c^{kk}} c^{n-i-j-k}$
$w' = a^n b^n c^j c^{n-i-j-k}$
$w' = a^n b^n c^{n-i-k}$ ✗