$a^n b^n c^n$ Language

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grammar AnBnCn
   nonterminal    B(2), A(4), S(0);
   terminal       a(2), b(2), c(2);
   start          S;

   S()            ::= B(x,y)                                  [ init  ]
   B(u,v)         ::= a(u,x) b(x,v) c(v,w)                    [ init1 ]
                   |  a(u,x) b(y,v) c(v,z) A(x,y,z,w)         [ init2 ]
   A(n1,n2,n3,n4) ::= a(n1,x) b(y,n2) c(n3,z) A(x,y,z,n4)     [ a1    ]
                   |  a(n1,x) b(x,n2) c(n3,n4)                [ a2    ]
end
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State $q_0(a, b)$

$\mathsf{S}() \quad \rightarrow \mathbf{.}\,\mathsf{B}(a, b)$
$\mathsf{B}(a, b) \rightarrow \mathbf{.}\,\mathsf{a}(a, n_1)\,\mathsf{b}(n_1, b)\,\mathsf{c}(b, n_2)$
$\mathsf{B}(a, b) \rightarrow \mathbf{.}\,\mathsf{a}(a, n_3)\,\mathsf{b}(n_4, b)\,\mathsf{c}(b, n_5)\,\mathsf{A}(n_3, n_4, n_5, n_6)$

$$\frac{\mathsf{B}(n_0, n_1)}{n_0 = a, n_1 = b} \longrightarrow q_{12}(n_0, n_1)$$
$$\frac{\mathsf{a}(n_0, n_1)}{n_0 = a, n_1\uparrow} \longrightarrow q_1(n_0, b, n_1, b)$$

State $q_1(a, b, c, b)$

$\mathsf{B}(a, b) \rightarrow \mathsf{a}(a, c)\ \mathbf{.}\ \mathsf{b}(c, b)\,\mathsf{c}(b, n_1)$
$\mathsf{B}(a, b) \rightarrow \mathsf{a}(a, c)\ \mathbf{.}\ \mathsf{b}(n_2, b)\,\mathsf{c}(b, n_3)\,\mathsf{A}(c, n_2, n_3, n_4)$

$$\frac{\mathsf{b}(n_0, n_1)}{n_0 = c, n_1 = b} \longrightarrow q_3(a, n_1, n_0)$$
$$\frac{\mathsf{b}(n_0, n_1)}{n_0\uparrow, n_1 = b} \longrightarrow q_2(a, n_1, c, n_0)$$

State $q_2(a, b, c, d)$

$\mathsf{B}(a, b) \rightarrow \mathsf{a}(a, c)\,\mathsf{b}(d, b)\ \mathbf{.}\ \mathsf{c}(b, n_1)\,\mathsf{A}(c, d, n_1, n_2)$

$$\frac{\mathsf{c}(n_0, n_1)}{n_0 = b, n_1\uparrow} \longrightarrow q_4(a, n_0, c, d, n_1)$$

State $q_3(a, b, c)$

$\mathsf{B}(a, b) \rightarrow \mathsf{a}(a, c)\,\mathsf{b}(c, b)\ \mathbf{.}\ \mathsf{c}(b, n_1)$

$$\frac{\mathsf{c}(n_0, n_1)}{n_0 = b, n_1\uparrow} \longrightarrow q_5(a, n_0, c, n_1)$$

State $q_4(a, b, c, d, e)$

$\mathsf{B}(a, b) \quad \rightarrow \mathsf{a}(a, c)\,\mathsf{b}(d, b)\,\mathsf{c}(b, e)\ \mathbf{.}\ \mathsf{A}(c, d, e, n_1)$
$\mathsf{A}(c, d, e, n_2) \rightarrow \mathbf{.}\,\mathsf{a}(c, n_3)\,\mathsf{b}(n_3, d)\,\mathsf{c}(e, n_2)$
$\mathsf{A}(c, d, e, n_4) \rightarrow \mathbf{.}\,\mathsf{a}(c, n_5)\,\mathsf{b}(n_6, d)\,\mathsf{c}(e, n_7)\,\mathsf{A}(n_5, n_6, n_7, n_4)$

$$\frac{\mathsf{A}(n_0, n_1, n_2, n_3)}{n_0 = c, n_1 = d, n_2 = e, n_3\uparrow} \longrightarrow q_{13}(a, b, n_0, n_1, n_2, n_3)$$
$$\frac{\mathsf{a}(n_0, n_1)}{n_0 = c, n_1\uparrow} \longrightarrow q_6(n_0, d, e, n_1, d, e)$$

State $q_5(a, b, c, d)$

$\mathsf{B}(a, b) \rightarrow \mathsf{a}(a, c)\,\mathsf{b}(c, b)\,\mathsf{c}(b, d)\mathbf{.} \quad [init1]$

State $q_6(a, b, c, d, b, c)$

$\mathsf{A}(a, b, c, n_1) \rightarrow \mathsf{a}(a, d)\ \mathbf{.}\ \mathsf{b}(n_2, b)\,\mathsf{c}(c, n_3)\,\mathsf{A}(d, n_2, n_3, n_1)$
$\mathsf{A}(a, b, c, n_4) \rightarrow \mathsf{a}(a, d)\ \mathbf{.}\ \mathsf{b}(d, b)\,\mathsf{c}(c, n_4)$

$$\frac{\mathsf{b}(n_0, n_1)}{n_0 = d, n_1 = b} \longrightarrow q_7(a, n_1, c, n_0)$$
$$\frac{\mathsf{b}(n_0, n_1)}{n_0\uparrow, n_1 = b} \longrightarrow q_8(a, n_1, c, d, n_0)$$

State $q_7(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{d})$

$\mathsf{A}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},n_1) \to \mathsf{a}(\boldsymbol{a},\boldsymbol{d})\,\mathsf{b}(\boldsymbol{d},\boldsymbol{b})\ \boldsymbol{.}\ \mathsf{c}(\boldsymbol{c},n_1)$

$$\xrightarrow[n_0=\boldsymbol{c},n_1\uparrow]{\mathsf{c}(n_0,n_1)} q_9(\boldsymbol{a},\boldsymbol{b},n_0,n_1,\boldsymbol{d})$$

State $q_8(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{d},\boldsymbol{e})$

$\mathsf{A}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},n_1) \to \mathsf{a}(\boldsymbol{a},\boldsymbol{d})\,\mathsf{b}(\boldsymbol{e},\boldsymbol{b})\ \boldsymbol{.}\ \mathsf{c}(\boldsymbol{c},n_2)\,\mathsf{A}(\boldsymbol{d},\boldsymbol{e},n_2,n_1)$

$$\xrightarrow[n_0=\boldsymbol{c},n_1\uparrow]{\mathsf{c}(n_0,n_1)} q_{10}(\boldsymbol{a},\boldsymbol{b},n_0,\boldsymbol{d},\boldsymbol{e},n_1)$$

State $q_9(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{d},\boldsymbol{e})$

$\mathsf{A}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{d}) \to \mathsf{a}(\boldsymbol{a},\boldsymbol{e})\,\mathsf{b}(\boldsymbol{e},\boldsymbol{b})\,\mathsf{c}(\boldsymbol{c},\boldsymbol{d})\boldsymbol{.}\quad [a2]$

State $q_{10}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{d},\boldsymbol{e},\boldsymbol{f})$

$\mathsf{A}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},n_1) \to \mathsf{a}(\boldsymbol{a},\boldsymbol{d})\,\mathsf{b}(\boldsymbol{e},\boldsymbol{b})\,\mathsf{c}(\boldsymbol{c},\boldsymbol{f})\ \boldsymbol{.}\ \mathsf{A}(\boldsymbol{d},\boldsymbol{e},\boldsymbol{f},n_1)$

$\mathsf{A}(\boldsymbol{d},\boldsymbol{e},\boldsymbol{f},n_2) \to \boldsymbol{.}\,\mathsf{a}(\boldsymbol{d},n_3)\,\mathsf{b}(n_3,\boldsymbol{e})\,\mathsf{c}(\boldsymbol{f},n_2)$

$\mathsf{A}(\boldsymbol{d},\boldsymbol{e},\boldsymbol{f},n_4) \to \boldsymbol{.}\,\mathsf{a}(\boldsymbol{d},n_5)\,\mathsf{b}(n_6,\boldsymbol{e})\,\mathsf{c}(\boldsymbol{f},n_7)\,\mathsf{A}(n_5,n_6,n_7,n_4)$

$$\xrightarrow[n_0=\boldsymbol{d},n_1=\boldsymbol{e},n_2=\boldsymbol{f},n_3\uparrow]{\mathsf{A}(n_0,n_1,n_2,n_3)} q_{11}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},n_3,n_0,n_1,n_2)$$

$$\xrightarrow[n_0=\boldsymbol{d},n_1\uparrow]{\mathsf{a}(n_0,n_1)} q_6(n_0,\boldsymbol{e},\boldsymbol{f},n_1,\boldsymbol{e},\boldsymbol{f})$$

State $q_{11}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{d},\boldsymbol{e},\boldsymbol{f},\boldsymbol{g})$

$\mathsf{A}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{d}) \to \mathsf{a}(\boldsymbol{a},\boldsymbol{e})\,\mathsf{b}(\boldsymbol{f},\boldsymbol{b})\,\mathsf{c}(\boldsymbol{c},\boldsymbol{g})\,\mathsf{A}(\boldsymbol{e},\boldsymbol{f},\boldsymbol{g},\boldsymbol{d})\boldsymbol{.}\quad [a1]$

State $q_{12}(\boldsymbol{a},\boldsymbol{b})$

$\mathsf{S}() \to \mathsf{B}(\boldsymbol{a},\boldsymbol{b})\boldsymbol{.}\quad [init]$

State $q_{13}(\boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{d},\boldsymbol{e},\boldsymbol{f})$

$\mathsf{B}(\boldsymbol{a},\boldsymbol{b}) \to \mathsf{a}(\boldsymbol{a},\boldsymbol{c})\,\mathsf{b}(\boldsymbol{d},\boldsymbol{b})\,\mathsf{c}(\boldsymbol{b},\boldsymbol{e})\,\mathsf{A}(\boldsymbol{c},\boldsymbol{d},\boldsymbol{e},\boldsymbol{f})\boldsymbol{.}\quad [init2]$