

Step	Algorithm:
1a	
4	where
2	
3	while do
2,3	\wedge
5a	where
6	
8	
5b	
7	
2	
	endwhile
2,3	$\wedge \neg(\quad)$
1b	

Step	Algorithm: $[C] := \text{SYR2K_LT_UNB}(A, B, C)$
1a	$C = \widehat{C}$
4	$A \rightarrow \left(A_L \middle A_R \right), B \rightarrow \left(B_L \middle B_R \right), C \rightarrow \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right)$ where A_L has 0 columns, B_L has 0 columns, C_{TL} is 0×0
2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T B_L + B_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
3	while $n(A_L) < n(A)$ do
2,3	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T B_L + B_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge n(A_L) < n(A)$
5a	$\left(A_L \middle A_R \right) \rightarrow \left(A_0 \middle a_1 \middle A_2 \right), \left(B_L \middle B_R \right) \rightarrow \left(B_0 \middle b_1 \middle B_2 \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow$ $\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$ where a_1 has 1 column, b_1 has 1 column, γ_{11} is 1×1
6	$\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right) = \left(\begin{array}{c c c} A_0^T B_0 + B_0^T A_0 + \widehat{C}_{00} & 0 & 0 \\ \hline \widehat{c}_{10}^T & \widehat{\gamma}_{11} & 0 \\ \hline \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{array} \right)$
8	$c_{10}^T := a_1^T B_0 + b_1^T A_0 + \widehat{c}_{10}^T$ $\gamma_{11} := a_1^T b_1 + b_1^T a_1 + \widehat{\gamma}_{11}$
5b	$\left(A_L \middle A_R \right) \leftarrow \left(A_0 \middle a_1 \middle A_2 \right), \left(B_L \middle B_R \right) \leftarrow \left(B_0 \middle b_1 \middle B_2 \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow$ $\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$
7	$\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right) = \left(\begin{array}{c c c} A_0^T B_0 + B_0^T A_0 + \widehat{C}_{00} & 0 & 0 \\ \hline a_1^T B_0 + b_1^T A_0 + \widehat{c}_{10}^T & a_1^T b_1 + b_1^T a_1 + \widehat{\gamma}_{11} & 0 \\ \hline \widehat{C}_{20} & \widehat{c}_{21} & \widehat{C}_{22} \end{array} \right)$
2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T B_L + B_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
	endwhile
2,3	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T B_L + B_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \neg(n(A_L) < n(A))$
1b	$[C] = \text{Syr2k_lt}(A, B, \widehat{C})$

Algorithm: $[C] := \text{SYR2K_LT_UNB}(A, B, C)$

$$A \rightarrow \left(A_L \middle| A_R \right), B \rightarrow \left(B_L \middle| B_R \right), C \rightarrow \left(\begin{array}{c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right)$$

where A_L has 0 columns, B_L has 0 columns, C_{TL} is 0×0

while $n(A_L) < n(A)$ **do**

$$\left(A_L \middle| A_R \right) \rightarrow \left(A_0 \middle| a_1 \middle| A_2 \right), \left(B_L \middle| B_R \right) \rightarrow \left(B_0 \middle| b_1 \middle| B_2 \right), \left(\begin{array}{c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left(\begin{array}{c|c|c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$$

where a_1 has 1 column, b_1 has 1 column, γ_{11} is 1×1

$$c_{10}^T := a_1^T B_0 + b_1^T A_0 + \widehat{c_{10}^T}$$

$$\gamma_{11} := a_1^T b_1 + b_1^T a_1 + \widehat{\gamma_{11}}$$

$$\left(A_L \middle| A_R \right) \leftarrow \left(A_0 \middle| a_1 \middle| A_2 \right), \left(B_L \middle| B_R \right) \leftarrow \left(B_0 \middle| b_1 \middle| B_2 \right), \left(\begin{array}{c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{c|c|c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$$

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	where
2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T B_L + B_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right)$
3	while do
2,3	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} A_L^T B_L + B_L^T A_L + \widehat{C}_{TL} & \widehat{C}_{TR} \\ \hline \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge$
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1b	$[C] = \text{Syr2k_lt}(A, B, \hat{C})$

Step	Algorithm: $[C] := \text{SYR2K_LT_UNB}(A, B, C)$
1a	$C = \hat{C}$
4	$A \rightarrow \left(A_L \middle A_R \right), B \rightarrow \left(B_L \middle B_R \right), C \rightarrow \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right)$ where A_L has 0 columns, B_L has 0 columns, C_{TL} is 0×0
2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \frac{A_L^T B_L + B_L^T A_L + \hat{C}_{TL}}{\hat{C}_{BL}} & \hat{C}_{TR} \\ \hline \hat{C}_{BR} & \end{array} \right)$
3	while $n(A_L) < n(A)$ do
2,3	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \frac{A_L^T B_L + B_L^T A_L + \hat{C}_{TL}}{\hat{C}_{BL}} & \hat{C}_{TR} \\ \hline \hat{C}_{BR} & \end{array} \right) \wedge n(A_L) < n(A)$
5a	$\left(A_L \middle A_R \right) \rightarrow \left(A_0 \middle a_1 \middle A_2 \right), \left(B_L \middle B_R \right) \rightarrow \left(B_0 \middle b_1 \middle B_2 \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow$ $\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$ where a_1 has 1 column, b_1 has 1 column, γ_{11} is 1×1
6	$\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right) = \left(\begin{array}{c c c} \frac{A_0^T B_0 + B_0^T A_0 + \hat{C}_{00}}{\hat{C}_{20}} & 0 & 0 \\ \hline \hat{c}_{10}^T & \hat{\gamma}_{11} & 0 \\ \hline \hat{C}_{20} & \hat{c}_{21} & \hat{C}_{22} \end{array} \right)$
8	$c_{10}^T := a_1^T B_0 + b_1^T A_0 + \hat{c}_{10}^T$ $\gamma_{11} := a_1^T b_1 + b_1^T a_1 + \hat{\gamma}_{11}$
5b	$\left(A_L \middle A_R \right) \leftarrow \left(A_0 \middle a_1 \middle A_2 \right), \left(B_L \middle B_R \right) \leftarrow \left(B_0 \middle b_1 \middle B_2 \right), \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow$ $\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$
7	$\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right) = \left(\begin{array}{c c c} \frac{A_0^T B_0 + B_0^T A_0 + \hat{C}_{00}}{a_1^T B_0 + b_1^T A_0 + \hat{c}_{10}^T} & 0 & 0 \\ \hline \frac{a_1^T B_0 + b_1^T A_0 + \hat{c}_{10}^T}{\hat{C}_{20}} & a_1^T b_1 + b_1^T a_1 + \hat{\gamma}_{11} & 0 \\ \hline \hat{C}_{20} & \hat{c}_{21} & \hat{C}_{22} \end{array} \right)$
2	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \frac{A_L^T B_L + B_L^T A_L + \hat{C}_{TL}}{\hat{C}_{BL}} & \hat{C}_{TR} \\ \hline \hat{C}_{BR} & \end{array} \right)$
	endwhile
2,3	$\left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left(\begin{array}{c c} \frac{A_L^T B_L + B_L^T A_L + \hat{C}_{TL}}{\hat{C}_{BL}} & \hat{C}_{TR} \\ \hline \hat{C}_{BR} & \end{array} \right) \wedge \neg(n(A_L) < n(A))$
1b	$[C] = \text{Syr2k_lt}(A, B, \hat{C})$

Step	Algorithm: $[C] := \text{SYR2K_LT_UNB}(A, B, C)$
	$A \rightarrow \left(A_L \middle A_R \right) , B \rightarrow \left(B_L \middle B_R \right) , C \rightarrow \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right)$ <p>where A_L has 0 columns, B_L has 0 columns, C_{TL} is 0×0</p>
	while $n(A_L) < n(A)$ do
	$\left(A_L \middle A_R \right) \rightarrow \left(A_0 \middle a_1 \middle A_2 \right) , \left(B_L \middle B_R \right) \rightarrow \left(B_0 \middle b_1 \middle B_2 \right) , \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow$ $\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$ <p>where a_1 has 1 column, b_1 has 1 column, γ_{11} is 1×1</p>
	$c_{10}^T := a_1^T B_0 + b_1^T A_0 + \widehat{c_{10}^T}$ $\gamma_{11} := a_1^T b_1 + b_1^T a_1 + \widehat{\gamma_{11}}$
	$\left(A_L \middle A_R \right) \leftarrow \left(A_0 \middle a_1 \middle A_2 \right) , \left(B_L \middle B_R \right) \leftarrow \left(B_0 \middle b_1 \middle B_2 \right) , \left(\begin{array}{c c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow$ $\left(\begin{array}{c c c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$
	endwhile

Algorithm: $[C] := \text{SYR2K_LT_UNB}(A, B, C)$

$$A \rightarrow \left(A_L \middle| A_R \right), B \rightarrow \left(B_L \middle| B_R \right), C \rightarrow \left(\begin{array}{c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right)$$

where A_L has 0 columns, B_L has 0 columns, C_{TL} is 0×0

while $n(A_L) < n(A)$ **do**

$$\left(A_L \middle| A_R \right) \rightarrow \left(A_0 \middle| a_1 \middle| A_2 \right), \left(B_L \middle| B_R \right) \rightarrow \left(B_0 \middle| b_1 \middle| B_2 \right), \left(\begin{array}{c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left(\begin{array}{c|c|c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$$

where a_1 has 1 column, b_1 has 1 column, γ_{11} is 1×1

$$c_{10}^T := a_1^T B_0 + b_1^T A_0 + \widehat{c_{10}^T}$$

$$\gamma_{11} := a_1^T b_1 + b_1^T a_1 + \widehat{\gamma_{11}}$$

$$\left(A_L \middle| A_R \right) \leftarrow \left(A_0 \middle| a_1 \middle| A_2 \right), \left(B_L \middle| B_R \right) \leftarrow \left(B_0 \middle| b_1 \middle| B_2 \right), \left(\begin{array}{c|c} C_{TL} & C_{TR} \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left(\begin{array}{c|c|c} C_{00} & c_{01} & C_{02} \\ \hline c_{10}^T & \gamma_{11} & c_{12}^T \\ \hline C_{20} & c_{21} & C_{22} \end{array} \right)$$

endwhile