

Step	<b>Algorithm:</b> $[C] := \text{SYR2K\_LN\_BLK\_VAR4}(A, B, C)$
1a	$\{C = \hat{C}$
4	$C \rightarrow \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right), A \rightarrow \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right), B \rightarrow \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right)$ <p>where <math>C_{TL}</math> is <math>0 \times 0</math>, <math>A_T</math> has 0 rows, <math>B_T</math> has 0 rows</p>
2	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \hat{C}_{TL} & * \\ \hline B_B A_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \right\}$
3	<b>while</b> $m(C_{TL}) < m(C)$ <b>do</b>
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \hat{C}_{TL} & * \\ \hline B_B A_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) \right\}$
5a	<p><b>Determine block size <math>b</math></b></p> $\left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left( \begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \rightarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \rightarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$ <p>where <math>C_{11}</math> is <math>b \times b</math>, <math>A_1</math> has <math>b</math> row, <math>B_1</math> has <math>b</math> row</p>
6	$\left\{ \begin{pmatrix} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \hat{C}_{00} & * & * \\ B_1 A_0^T + \hat{C}_{10} & C_{11} & * \\ B_2 A_0^T + \hat{C}_{20} & C_{21} & C_{22} \end{pmatrix} \right\}$
8	$C_{11} := A_1 B_1^T + B_1 A_1^T + C_{11}$ $C_{10} := A_1 B_0^T + C_{10}$ $C_{21} := B_2 A_1^T + C_{21}$
7	$\left\{ \begin{pmatrix} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \hat{C}_{00} & * & * \\ A_1 B_0^T + B_1 A_0^T + \hat{C}_{10} & A_1 B_1^T + B_1 A_1^T + \hat{C}_{11} & * \\ B_2 A_0^T + \hat{C}_{20} & B_2 A_1^T + \hat{C}_{21} & C_{22} \end{pmatrix} \right\}$
5b	$\left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left( \begin{array}{c c} C_{00} & * \\ \hline C_{10} & C_{11} \\ C_{20} & C_{21} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \leftarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$
2	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \hat{C}_{TL} & * \\ \hline B_B A_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \right\}$
	<b>endwhile</b>
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \hat{C}_{TL} & * \\ \hline B_B A_T^T + \hat{C}_{BL} & \hat{C}_{BR} \end{array} \right) \wedge \neg(m(C_{TL}) < m(C)) \right\}$
1b	$\{[C] = \text{syr2k\_ln}(A, B, \hat{C})$

Step	Algorithm: $[C] := \text{SYR2K\_LN\_BLK\_VAR4}(A, B, C)$
1a	{
4	
	where
2	{
3	while do
2,3	{
	$\wedge$
5a	Determine block size $b$
	where
6	{
8	
7	{
5b	
2	{
	endwhile
2,3	{
	$\wedge \neg($
1b	{

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3	while do
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \right\}$
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	endwhile
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \neg( \quad ) \right\}$
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3	while $m(C_{TL}) < m(C)$ do
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) \right\}$
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5a	<p><b>Determine block size <math>b</math></b></p> <p style="color: blue;">where</p>
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3	<b>while</b> $m(C_{TL}) < m(C)$ <b>do</b>
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	<b>endwhile</b>
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8	
7	$\left\{ \begin{pmatrix} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ A_1 B_0^T + B_1 A_0^T + \widehat{C}_{10} & A_1 B_1^T + B_1 A_1^T + \widehat{C}_{11} & * \\ B_2 A_0^T + \widehat{C}_{20} & B_2 A_1^T + \widehat{C}_{21} & C_{22} \end{pmatrix} \right\}$
5b	$\left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left( \begin{array}{c c} C_{00} & * \\ \hline C_{10} & C_{11} \\ C_{20} & C_{21} & C_{22} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \leftarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$
2	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \right\}$
	<b>endwhile</b>
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \neg(m(C_{TL}) < m(C)) \right\}$
1b	$\{[C] = \text{syr2k\_ln}(A, B, \widehat{C})$

Step	<b>Algorithm:</b> $[C] := \text{SYR2K\_LN\_BLK\_VAR4}(A, B, C)$
1a	$\{C = \widehat{C}$
4	$C \rightarrow \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right), A \rightarrow \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right), B \rightarrow \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right)$ <p>where <math>C_{TL}</math> is <math>0 \times 0</math>, <math>A_T</math> has 0 rows, <math>B_T</math> has 0 rows</p>
2	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \right\}$
3	<b>while</b> $m(C_{TL}) < m(C)$ <b>do</b>
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge m(C_{TL}) < m(C) \right\}$
5a	<p><b>Determine block size <math>b</math></b></p> $\left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left( \begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \rightarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \rightarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$ <p>where <math>C_{11}</math> is <math>b \times b</math>, <math>A_1</math> has <math>b</math> row, <math>B_1</math> has <math>b</math> row</p>
6	$\left\{ \begin{pmatrix} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ B_1 A_0^T + \widehat{C}_{10} & C_{11} & * \\ B_2 A_0^T + \widehat{C}_{20} & C_{21} & C_{22} \end{pmatrix} \right\}$
8	$C_{11} := A_1 B_1^T + B_1 A_1^T + C_{11}$ $C_{10} := A_1 B_0^T + C_{10}$ $C_{21} := B_2 A_1^T + C_{21}$
7	$\left\{ \begin{pmatrix} C_{00} & * & * \\ C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_0 B_0^T + B_0 A_0^T + \widehat{C}_{00} & * & * \\ A_1 B_0^T + B_1 A_0^T + \widehat{C}_{10} & A_1 B_1^T + B_1 A_1^T + \widehat{C}_{11} & * \\ B_2 A_0^T + \widehat{C}_{20} & B_2 A_1^T + \widehat{C}_{21} & C_{22} \end{pmatrix} \right\}$
5b	$\left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left( \begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \leftarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$
2	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \right\}$
	<b>endwhile</b>
2,3	$\left\{ \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) = \left( \begin{array}{c c} A_T B_T^T + B_T A_T^T + \widehat{C}_{TL} & * \\ \hline B_B A_T^T + \widehat{C}_{BL} & \widehat{C}_{BR} \end{array} \right) \wedge \neg(m(C_{TL}) < m(C)) \right\}$
1b	$\{[C] = \text{syr2k\_ln}(A, B, \widehat{C})$

	<b>Algorithm:</b> $[C] := \text{SYR2K\_LN\_BLK\_VAR4}(A, B, C)$
	$C \rightarrow \left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right), A \rightarrow \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right), B \rightarrow \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right)$ <p>where <math>C_{TL}</math> is <math>0 \times 0</math>, <math>A_T</math> has 0 rows, <math>B_T</math> has 0 rows</p>
	<b>while</b> $m(C_{TL}) < m(C)$ <b>do</b>
	<p><b>Determine block size <math>b</math></b></p> $\left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left( \begin{array}{c cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \rightarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \rightarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$ <p>where <math>C_{11}</math> is <math>b \times b</math>, <math>A_1</math> has <math>b</math> row, <math>B_1</math> has <math>b</math> row</p>
	$C_{11} := A_1 B_1^T + B_1 A_1^T + C_{11}$ $C_{10} := A_1 B_0^T + C_{10}$ $C_{21} := B_2 A_1^T + C_{21}$
	$\left( \begin{array}{c c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left( \begin{array}{cc c} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \leftarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$
	<b>endwhile</b>

**Algorithm:**  $[C] := \text{SYR2K\_LN\_BLK\_VAR4}(A, B, C)$

$$C \rightarrow \left( \begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right), A \rightarrow \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right), B \rightarrow \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right)$$

**where**  $C_{TL}$  is  $0 \times 0$ ,  $A_T$  has 0 rows,  $B_T$  has 0 rows

**while**  $m(C_{TL}) < m(C)$  **do**

**Determine block size**  $b$

$$\left( \begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \rightarrow \left( \begin{array}{c|cc} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \rightarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \rightarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$$

**where**  $C_{11}$  is  $b \times b$ ,  $A_1$  has  $b$  row,  $B_1$  has  $b$  row

$$C_{11} := A_1 B_1^T + B_1 A_1^T + C_{11}$$

$$C_{10} := A_1 B_0^T + C_{10}$$

$$C_{21} := B_2 A_1^T + C_{21}$$

$$\left( \begin{array}{c|c} C_{TL} & * \\ \hline C_{BL} & C_{BR} \end{array} \right) \leftarrow \left( \begin{array}{cc|c} C_{00} & * & * \\ \hline C_{10} & C_{11} & * \\ C_{20} & C_{21} & C_{22} \end{array} \right), \left( \begin{array}{c} A_T \\ \hline A_B \end{array} \right) \leftarrow \left( \begin{array}{c} A_0 \\ \hline A_1 \\ A_2 \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ B_2 \end{array} \right)$$

**endwhile**