

Step	<b>Algorithm:</b> $C := AB + C$ where $A$ is symmetric and stored in the lower triangular part
1a	$\{C = \hat{C}$
4	$A \rightarrow \left( \begin{array}{c c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right), B \rightarrow \left( \begin{array}{c} B_T \\ B_B \end{array} \right), C \rightarrow \left( \begin{array}{c} C_T \\ C_B \end{array} \right)$ <b>where</b> $A_{TL}$ is $0 \times 0$ , $B_T$ has 0 rows, $C_T$ has 0 rows
2	$\left\{ \left( \begin{array}{c} C_T \\ C_B \end{array} \right) = \left( \begin{array}{c} A_{TL}B_T + A_{BL}^T B_B + \hat{C}_T \\ A_{BL}B_T + \hat{C}_B \end{array} \right) \right\}$
3	<b>while</b> $m(A_{TL}) < m(A)$ <b>do</b>
2,3	$\left\{ \left( \begin{array}{c} C_T \\ C_B \end{array} \right) = \left( \begin{array}{c} A_{TL}B_T + A_{BL}^T B_B + \hat{C}_T \\ A_{BL}B_T + \hat{C}_B \end{array} \right) \wedge m(A_{TL}) < m(A) \right\}$
5a	<b>Determine block size <math>b</math></b> $\left( \begin{array}{c c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right) \rightarrow \left( \begin{array}{c cc} A_{00} & A_{01} & A_{02} \\ \hline A_{10} & A_{11} & A_{12} \\ A_{20} & A_{21} & A_{22} \end{array} \right), \left( \begin{array}{c} B_T \\ B_B \end{array} \right) \rightarrow \left( \begin{array}{c} B_0 \\ B_1 \\ B_2 \end{array} \right), \left( \begin{array}{c} C_T \\ C_B \end{array} \right) \rightarrow \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right)$ <b>where</b> $A_{11}$ is $b \times b$ , $B_1$ has $b$ rows, $C_1$ has $b$ rows
6	$\left\{ \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right) = \left( \begin{array}{c} A_{00}B_0 + A_{10}^T B_1 + A_{20}^T B_2 + \hat{C}_0 \\ A_{10}B_0 + \hat{C}_1 \\ A_{20}B_0 + \hat{C}_2 \end{array} \right) \right\}$
8	$C_0 := A_{00}B_0 + A_{10}^T B_1 + A_{20}^T B_2 + C_0$ $C_1 := A_{10}B_0 + A_{11}B_1 + A_{21}^T B_2 + C_1$ $C_2 := A_{20}B_0 + A_{21}B_1 + A_{22}B_2 + C_2$
7	$\left\{ \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right) = \left( \begin{array}{c} A_{00}B_0 + A_{10}^T B_1 + A_{20}^T B_2 + \hat{C}_0 \\ A_{10}B_0 + A_{11}B_1 + A_{21}^T B_2 + \hat{C}_1 \\ A_{20}B_0 + A_{21}B_1 + \hat{C}_2 \end{array} \right) \right\}$
5b	$\left( \begin{array}{c c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right) \leftarrow \left( \begin{array}{c cc} A_{00} & A_{01} & A_{02} \\ \hline A_{10} & A_{11} & A_{12} \\ A_{20} & A_{21} & A_{22} \end{array} \right), \left( \begin{array}{c} B_T \\ B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ B_1 \\ B_2 \end{array} \right), \left( \begin{array}{c} C_T \\ C_B \end{array} \right) \leftarrow \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right)$
2	$\left\{ \left( \begin{array}{c} C_T \\ C_B \end{array} \right) = \left( \begin{array}{c} A_{TL}B_T + A_{BL}^T B_B + \hat{C}_T \\ A_{BL}B_T + \hat{C}_B \end{array} \right) \right\}$
	<b>endwhile</b>
2,3	$\left\{ \left( \begin{array}{c} C_T \\ C_B \end{array} \right) = \left( \begin{array}{c} A_{TL}B_T + A_{BL}^T B_B + \hat{C}_T \\ A_{BL}B_T + \hat{C}_B \end{array} \right) \wedge \neg(m(A_{TL}) < m(A)) \right\}$
1b	$\{C = AB + \hat{C}$

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	where
2	{
3	while do
2,3	{
	$\wedge$
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8	$C_0 := A_{00}B_0 + A_{10}^T B_1 + A_{20}^T B_2 + C_0$ $A_{10}B_0 +$ $A_{20}B_0 + \quad A_{22}B_2 +$
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3	while do
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2	$\left\{ \left( \begin{array}{c} C_T \\ C_B \end{array} \right) = \left( \begin{array}{c} A_{TL}B_T + A_{BL}^T B_B + \widehat{C}_T \\ A_{BL}B_T + \widehat{C}_B \end{array} \right) \right\}$
3	<b>while</b> $m(A_{TL}) < m(A)$ <b>do</b>
2,3	$\left\{ \left( \begin{array}{c} C_T \\ C_B \end{array} \right) = \left( \begin{array}{c} A_{TL}B_T + A_{BL}^T B_B + \widehat{C}_T \\ A_{BL}B_T + \widehat{C}_B \end{array} \right) \wedge m(A_{TL}) < m(A) \right\}$
5a	<p><b>Determine block size <math>b</math></b></p> $\left( \begin{array}{c c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right) \rightarrow \left( \begin{array}{c cc} A_{00} & A_{01} & A_{02} \\ \hline A_{10} & A_{11} & A_{12} \\ A_{20} & A_{21} & A_{22} \end{array} \right), \left( \begin{array}{c} B_T \\ B_B \end{array} \right) \rightarrow \left( \begin{array}{c} B_0 \\ B_1 \\ B_2 \end{array} \right), \left( \begin{array}{c} C_T \\ C_B \end{array} \right) \rightarrow \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right)$ <p>where <math>A_{11}</math> is <math>b \times b</math>, <math>B_1</math> has <math>b</math> rows, <math>C_1</math> has <math>b</math> rows</p>
6	$\left\{ \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right) = \left( \begin{array}{c} A_{00}B_0 + A_{10}^T B_1 + A_{20}^T B_2 + \widehat{C}_0 \\ A_{10}B_0 + \widehat{C}_1 \\ A_{20}B_0 + \widehat{C}_2 \end{array} \right) \right\}$
8	$C_0 := A_{00}B_0 + A_{10}^T B_1 + A_{20}^T B_2 + \widehat{C}_0$ $C_1 := A_{10}B_0 + A_{11}B_1 + A_{21}^T B_2 + \widehat{C}_1$ $C_2 := A_{20}B_0 + A_{21}B_1 + A_{22}B_2 + \widehat{C}_2$
7	$\left\{ \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right) = \left( \begin{array}{c} A_{00}B_0 + A_{10}^T B_1 + A_{20}^T B_2 + \widehat{C}_0 \\ A_{10}B_0 + A_{11}B_1 + A_{21}^T B_2 + \widehat{C}_1 \\ A_{20}B_0 + A_{21}B_1 + \widehat{C}_2 \end{array} \right) \right\}$
5b	$\left( \begin{array}{c c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right) \leftarrow \left( \begin{array}{c cc} A_{00} & A_{01} & A_{02} \\ \hline A_{10} & A_{11} & A_{12} \\ A_{20} & A_{21} & A_{22} \end{array} \right), \left( \begin{array}{c} B_T \\ B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ B_1 \\ B_2 \end{array} \right), \left( \begin{array}{c} C_T \\ C_B \end{array} \right) \leftarrow \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right)$
2	$\left\{ \left( \begin{array}{c} C_T \\ C_B \end{array} \right) = \left( \begin{array}{c} A_{TL}B_T + A_{BL}^T B_B + \widehat{C}_T \\ A_{BL}B_T + \widehat{C}_B \end{array} \right) \right\}$
	<b>endwhile</b>
2,3	$\left\{ \left( \begin{array}{c} C_T \\ C_B \end{array} \right) = \left( \begin{array}{c} A_{TL}B_T + A_{BL}^T B_B + \widehat{C}_T \\ A_{BL}B_T + \widehat{C}_B \end{array} \right) \wedge \neg(m(A_{TL}) < m(A)) \right\}$
1b	$\{C = AB + \widehat{C}$

	<b>Algorithm:</b> $C := AB + C$ where $A$ is symmetric and stored in the lower triangular part
	$A \rightarrow \left( \begin{array}{c c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right), B \rightarrow \left( \begin{array}{c} B_T \\ B_B \end{array} \right), C \rightarrow \left( \begin{array}{c} C_T \\ C_B \end{array} \right)$ <p>where <math>A_{TL}</math> is <math>0 \times 0</math>, <math>B_T</math> has 0 rows, <math>C_T</math> has 0 rows</p>
	<b>while</b> $m(A_{TL}) < m(A)$ <b>do</b>
	<p><b>Determine block size <math>b</math></b></p> $\left( \begin{array}{c c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right) \rightarrow \left( \begin{array}{c cc} A_{00} & A_{01} & A_{02} \\ \hline A_{10} & A_{11} & A_{12} \\ A_{20} & A_{21} & A_{22} \end{array} \right), \left( \begin{array}{c} B_T \\ B_B \end{array} \right) \rightarrow \left( \begin{array}{c} B_0 \\ B_1 \\ B_2 \end{array} \right), \left( \begin{array}{c} C_T \\ C_B \end{array} \right) \rightarrow \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right)$ <p>where <math>A_{11}</math> is <math>b \times b</math>, <math>B_1</math> has <math>b</math> rows, <math>C_1</math> has <math>b</math> rows</p>
	$C_0 := A_{00}B_0 + A_{10}^T B_1 + A_{20}^T B_2 + C_0$ $C_1 := A_{10}B_0 + A_{11}B_1 + A_{21}^T B_2 + C_1$ $C_2 := A_{20}B_0 + A_{21}B_1 + A_{22}B_2 + C_2$
	$\left( \begin{array}{c c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right) \leftarrow \left( \begin{array}{c cc} A_{00} & A_{01} & A_{02} \\ \hline A_{10} & A_{11} & A_{12} \\ A_{20} & A_{21} & A_{22} \end{array} \right), \left( \begin{array}{c} B_T \\ B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ B_1 \\ B_2 \end{array} \right), \left( \begin{array}{c} C_T \\ C_B \end{array} \right) \leftarrow \left( \begin{array}{c} C_0 \\ C_1 \\ C_2 \end{array} \right)$
	<b>endwhile</b>

**Algorithm:**  $C := AB + C$  where  $A$  is symmetric and stored in the lower triangular part

$$A \rightarrow \left( \begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right), B \rightarrow \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right), C \rightarrow \left( \begin{array}{c} C_T \\ \hline C_B \end{array} \right)$$

where  $A_{TL}$  is  $0 \times 0$ ,  $B_T$  has 0 rows,  $C_T$  has 0 rows

while  $m(A_{TL}) < m(A)$  do

**Determine block size  $b$**

$$\left( \begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right) \rightarrow \left( \begin{array}{c|c|c} A_{00} & A_{01} & A_{02} \\ \hline A_{10} & A_{11} & A_{12} \\ \hline A_{20} & A_{21} & A_{22} \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \rightarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ \hline B_2 \end{array} \right), \left( \begin{array}{c} C_T \\ \hline C_B \end{array} \right) \rightarrow \left( \begin{array}{c} C_0 \\ \hline C_1 \\ \hline C_2 \end{array} \right)$$

where  $A_{11}$  is  $b \times b$ ,  $B_1$  has  $b$  rows,  $C_1$  has  $b$  rows

$$C_1 := A_{11}B_1 + A_{21}^T B_1 + C_1$$

$$C_2 := A_{21}B_1 + C_2$$

$$\left( \begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array} \right) \leftarrow \left( \begin{array}{c|c|c} A_{00} & A_{01} & A_{02} \\ \hline A_{10} & A_{11} & A_{12} \\ \hline A_{20} & A_{21} & A_{22} \end{array} \right), \left( \begin{array}{c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left( \begin{array}{c} B_0 \\ \hline B_1 \\ \hline B_2 \end{array} \right), \left( \begin{array}{c} C_T \\ \hline C_B \end{array} \right) \leftarrow \left( \begin{array}{c} C_0 \\ \hline C_1 \\ \hline C_2 \end{array} \right)$$

endwhile