Algorithm: $[A] := \text{SET\_TO\_ZERO\_UNB\_VAR1}(A)$

Partition

$A \rightarrow \left(\begin{array}{c|c} A_L & A_R \end{array} \right)$

where A_L has 0 columns

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

Repartition

$\left(\begin{array}{c|c} A_L & A_R \end{array} \right) \rightarrow \left(\begin{array}{c|c|c} A_0 & a_1 & A_2 \end{array} \right)$

where a_1 has 1 column

$a_1 := 0$ (Set the current column to zero)

Continue with

$\left(\begin{array}{c|c} A_L & A_R \end{array} \right) \leftarrow \left(\begin{array}{c|c|c} A_0 & a_1 & A_2 \end{array} \right)$

endwhile

```
function [ A_out ] = Set_to_zero_unb_var1( A )

  [ AL, AR ] = FLA_Part_1x2( A,  ...
                             0, 'FLA_LEFT' );

  while ( size( AL, 2 ) < size( A, 2 ) )

    [ A0, a1, A2 ]= FLA_Repart_1x2_to_1x3( AL, AR, ...
                                           1, 'FLA_RIGHT' );

    %-------------------------------------------------------------%

    a1 = laff_zerov( a1 );

    %-------------------------------------------------------------%

    [ AL, AR ] = FLA_Cont_with_1x3_to_1x2( A0, a1, A2, ...
                                           'FLA_LEFT' );

  end

  A_out = [ AL, AR ];

return
```

☛ Click to view .m file Set_to_zero_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_ZERO\_UNB\_VAR2}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right)$$

where A_T has 0 rows

while $m(A_T) < m(A)$ **do**

Repartition

$$\left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \rightarrow \left(\begin{array}{c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right)$$

where a_1 has 1 row

$a_1^T := 0$

Continue with

$$\left(\begin{array}{c} A_T \\ \hline A_B \end{array}\right) \leftarrow \left(\begin{array}{c} A_0 \\ \hline a_1^T \\ \hline A_2 \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_zero_unb_var2( A )

  [ AT,  ...
    AB ] = FLA_Part_2x1( A,  ...
                         0,  'FLA_TOP' );

  while ( size( AT, 1 ) < size( A, 1 ) )

    [ A0,  ...
      a1t,  ...
      A2 ] = FLA_Repart_2x1_to_3x1( AT,  ...
                                    AB,  ...
                                    1,  'FLA_BOTTOM' );

    %-------------------------------------------------------------------------%

    a1t = laff_zerov( a1t );

    %-------------------------------------------------------------------------%

    [ AT,  ...
      AB ] = FLA_Cont_with_3x1_to_2x1( A0,  ...
                                       a1t,  ...
                                       A2,  ...
                                       'FLA_TOP' );

  end

  A_out = [ AT
            AB ];

return
```

☛ Click to view .m file Set_to_zero_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_IDENTITY\_UNB\_VAR1}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{01} := 0$
$\alpha_{11} := 1$
$a_{21} := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_identity_unb_var1( A )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a01 = laff_zerov( a01 );
    alpha11 = laff_onev( alpha11 );
    a21 = laff_zerov( a21 );

    %------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_identity_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_IDENTITY\_UNB\_VAR2}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{10}^T := 0$
$\alpha_{11} := 1$
$a_{12}^T := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_identity_unb_var2( A )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a10t = laff_zerov( a10t );
    alpha11 = laff_onev( alpha11 );
    a12t = laff_zerov( a12t );

    %------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_identity_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_IDENTITY\_UNB\_VAR3}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{01} := 0$
$\alpha_{11} := 1$
$a_{10}^T := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_identity_unb_var3( A )

  [ ATL, ATR,  ...
    ABL, ABR ] = FLA_Part_2x2( A,  ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR,  ...
                                                    ABL, ABR,  ...
                                                    1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a01 = laff_zerov( a01 );
    alpha11 = laff_onev( alpha11 );
    a01t = laff_zerov( a01t );

    %------------------------------------------------------------%

    [ ATL, ATR,  ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_identity_unb_var3.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_IDENTITY\_UNB\_VAR4}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{12}^T := 0$
$\alpha_{11} := 1$
$a_{21} := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_identity_unb_var4( A )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a12t = laff_zerov( a12t );
    alpha11 = laff_onev( alpha11 );
    a21 = laff_zerov( a21 );

    %------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_identity_unb_var4.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_DIAGONAL\_MATRIX\_UNB\_VAR1}(A, x)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right), \; x \rightarrow \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right)$$

where A_{TL} is 0×0, x_T has 0 rows

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right), \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right) \rightarrow \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array}\right)$$

where α_{11} is 1×1, χ_1 has 1 row

$a_{01} := 0$

$\alpha_{11} := \chi_1$

$a_{21} := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right), \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right) \leftarrow \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_diagonal_matrix_unb_var1( A, x )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  [ xT, ...
    xB ] = FLA_Part_2x1( x, ...
                         0, 'FLA_TOP' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    [ x0, ...
      chi1, ...
      x2 ] = FLA_Repart_2x1_to_3x1( xT, ...
                                    xB, ...
                                    1, 'FLA_BOTTOM' );

    %-------------------------------------------------------------%

    a01 = laff_zerov( a01 );
    alpha11 = laff_copy( chi1, alpha11 );
    a21 = laff_zerov( a21 );

    %-------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

    [ xT, ...
      xB ] = FLA_Cont_with_3x1_to_2x1( x0, ...
                                       chi1, ...
                                       x2, ...
                                       'FLA_TOP' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_diagonal_matrix_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_DIAGONAL\_MATRIX\_UNB\_VAR2}(A, x)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right), \; x \rightarrow \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right)$$

where A_{TL} is 0×0, x_T has 0 rows

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right), \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right) \rightarrow \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array}\right)$$

where α_{11} is 1×1, χ_1 has 1 row

$a_{10}^T := 0$
$\alpha_{11} := \chi_1$
$a_{12}^T := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right), \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right) \leftarrow \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_diagonal_matrix_unb_var2( A, x )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  [ xT, ...
    xB ] = FLA_Part_2x1( x, ...
                         0, 'FLA_TOP' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    [ x0, ...
      chi1, ...
      x2 ] = FLA_Repart_2x1_to_3x1( xT, ...
                                    xB, ...
                                    1, 'FLA_BOTTOM' );

    %-------------------------------------------------------------%

    a10t = laff_zerov( a10t );
    alpha11 = laff_copy( chi1, alpha11 );
    a12t = laff_zerov( a12t );

    %-------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

    [ xT, ...
      xB ] = FLA_Cont_with_3x1_to_2x1( x0, ...
                                       chi1, ...
                                       x2, ...
                                       'FLA_TOP' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_diagonal_matrix_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_DIAGONAL\_MATRIX\_UNB\_VAR3}(A, x)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right), \; x \rightarrow \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right)$$

where A_{TL} is 0×0, x_T has 0 rows

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right), \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right) \rightarrow \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array}\right)$$

where α_{11} is 1×1, χ_1 has 1 row

$a_{01} := 0$
$\alpha_{11} := \chi_1$
$a_{10}^T := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right), \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right) \leftarrow \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_diagonal_matrix_unb_var3( A, x )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  [ xT, ...
    xB ] = FLA_Part_2x1( x, ...
                         0, 'FLA_TOP' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    [ x0, ...
      chi1, ...
      x2 ] = FLA_Repart_2x1_to_3x1( xT, ...
                                    xB, ...
                                    1, 'FLA_BOTTOM' );

    %-------------------------------------------------------------%

    a01 = laff_zerov( a01 );
    alpha11 = laff_copy( chi1, alpha11 );
    a10t = laff_zerov( a10t );

    %-------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

    [ xT, ...
      xB ] = FLA_Cont_with_3x1_to_2x1( x0, ...
                                       chi1, ...
                                       x2, ...
                                       'FLA_TOP' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_diagonal_matrix_unb_var3.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_DIAGONAL\_MATRIX\_UNB\_VAR4}(A, x)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right), \; x \rightarrow \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right)$$

where A_{TL} is 0×0, x_T has 0 rows

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right), \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right) \rightarrow \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array}\right)$$

where α_{11} is 1×1, χ_1 has 1 row

$a_{12}^T := 0$
$\alpha_{11} := \chi_1$
$a_{21} := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right), \left(\begin{array}{c} x_T \\ \hline x_B \end{array}\right) \leftarrow \left(\begin{array}{c} x_0 \\ \hline \chi_1 \\ \hline x_2 \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_diagonal_matrix_unb_var4( A, x )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  [ xT, ...
    xB ] = FLA_Part_2x1( x, ...
                         0, 'FLA_TOP' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    [ x0, ...
      chi1, ...
      x2 ] = FLA_Repart_2x1_to_3x1( xT, ...
                                    xB, ...
                                    1, 'FLA_BOTTOM' );

    %-------------------------------------------------------------%

    a12t = laff_zerov( a12t );
    alpha11 = laff_copy( chi1, alpha11 );
    a21 = laff_zerov( a21 );

    %-------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

    [ xT, ...
      xB ] = FLA_Cont_with_3x1_to_2x1( x0, ...
                                       chi1, ...
                                       x2, ...
                                       'FLA_TOP' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_diagonal_matrix_unb_var4.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_LOWER\_TRIANGULAR\_MATRIX\_UNB\_VAR1}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{01} := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_lower_triangular_matrix_unb_var1( A )

  [ ATL, ATR,  ...
    ABL, ABR ] = FLA_Part_2x2( A,  ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,   a01,     A02,   ...
      a10t,  alpha11, a12t,  ...
      A20,   a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR,  ...
                                                     ABL, ABR,  ...
                                                     1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a01 := laff_zerov( a01 );

    %------------------------------------------------------------%

    [ ATL, ATR,  ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,   a01,     A02,   ...
                                             a10t,  alpha11, a12t,  ...
                                             A20,   a21,     A22,   ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_lower_triangular_matrix_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_LOWER\_TRIANGULAR\_MATRIX\_UNB\_VAR2}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{12}^T := 0$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_lower_triangular_matrix_unb_var2( A )

  [ ATL, ATR,  ...
    ABL, ABR ] = FLA_Part_2x2( A,  ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,   a01,     A02,   ...
      a10t,  alpha11, a12t,  ...
      A20,   a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR,  ...
                                                     ABL, ABR,  ...
                                                     1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a12t := laff_zerov( a12t );

    %------------------------------------------------------------%

    [ ATL, ATR,  ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,   a01,     A02,   ...
                                             a10t,  alpha11, a12t,  ...
                                             A20,   a21,     A22,   ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_lower_triangular_matrix_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_UNIT\_LOWER\_TRIANGULAR\_MATRIX\_UNB\_VAR1}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{01} := 0$

$\alpha_{11} := 1$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_unit_lower_triangular_matrix_unb_var1( A )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a01 := laff_zerov( a01 );
    alpha11 := laff_onev( alpha11 );

    %------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_unit_lower_triangular_matrix_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SET\_TO\_UNIT\_UNIT\_LOWER\_TRIANGULAR\_MATRIX\_UNB\_VAR2}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{12}^T := 0$

$\alpha_{11} := 1$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Set_to_unit_lower_triangular_matrix_unb_var2( A )

  [ ATL, ATR, ...
    ABL, ABR ] = FLA_Part_2x2( A, ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,  a01,     A02,  ...
      a10t, alpha11, a12t, ...
      A20,  a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR, ...
                                                    ABL, ABR, ...
                                                    1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a12t := laff_zerov( a12t );
    alpha11 := laff_onev( alpha11 );

    %------------------------------------------------------------%

    [ ATL, ATR, ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,  a01,     A02,  ...
                                             a10t, alpha11, a12t, ...
                                             A20,  a21,     A22,  ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Set_to_unit_lower_triangular_matrix_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[B] := \text{TRANSPOSE\_UNB}(A, B)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_L & A_R \end{array} \right), \quad B \rightarrow \left(\begin{array}{c} B_T \\ \hline B_B \end{array} \right)$$

where A_L has 0 columns, B_T has 0 rows

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

Repartition

$$\left(\begin{array}{c|c} A_L & A_R \end{array} \right) \rightarrow \left(\begin{array}{c|c|c} A_0 & a_1 & A_2 \end{array} \right), \quad \left(\begin{array}{c} B_T \\ \hline B_B \end{array} \right) \rightarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array} \right)$$

where a_1 has 1 column, b_1 has 1 row

$b_1^T := a_1^T$ (Set the current row of B to the current column of A)

Continue with

$$\left(\begin{array}{c|c} A_L & A_R \end{array} \right) \leftarrow \left(\begin{array}{c|c|c} A_0 & a_1 & A_2 \end{array} \right), \quad \left(\begin{array}{c} B_T \\ \hline B_B \end{array} \right) \leftarrow \left(\begin{array}{c} B_0 \\ \hline b_1^T \\ \hline B_2 \end{array} \right)$$

endwhile

```
function [ B_out ] = Transpose_unb_var1( A, B )

  [ AL, AR ] = FLA_Part_1x2( A, ...
                             0, 'FLA_LEFT' );

  [ BT, ...
    BB ] = FLA_Part_2x1( B, ...
                         0, 'FLA_TOP' );

  while ( size( AL, 2 ) < size( A, 2 ) )

    [ A0, a1, A2 ]= FLA_Repart_1x2_to_1x3( AL, AR, ...
                                           1, 'FLA_RIGHT' );

    [ B0, ...
      b1t, ...
      B2 ] = FLA_Repart_2x1_to_3x1( BT, ...
                                    BB, ...
                                    1, 'FLA_BOTTOM' );

    %------------------------------------------------------------%

    b1t = laff_copy( a1, b1t );

    %------------------------------------------------------------%

    [ AL, AR ] = FLA_Cont_with_1x3_to_1x2( A0, a1, A2, ...
                                           'FLA_LEFT' );

    [ BT, ...
      BB ] = FLA_Cont_with_3x1_to_2x1( B0, ...
                                       b1t, ...
                                       B2, ...
                                       'FLA_TOP' );

  end

  B_out = [ BT
            BB ];

return
```

☛ Click to view .m file Transpose_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[B] := \text{TRANSPOSE\_ALTERNATIVE\_UNB}(A, B)$

Partition

$$A \rightarrow \left(\frac{A_T}{A_B}\right), \quad B \rightarrow \left(\begin{array}{c|c} B_L & B_R \end{array}\right)$$

where A_T has 0 rows, B_L has 0 columns

while $m(A_T) < m(A)$ **do**

Repartition

$$\left(\frac{A_T}{A_B}\right) \rightarrow \left(\frac{\frac{A_0}{a_1^T}}{A_2}\right), \quad \left(\begin{array}{c|c} B_L & B_R \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} B_0 & b_1 & B_2 \end{array}\right)$$

where a_1 has 1 row, b_1 has 1 column

Continue with

$$\left(\frac{A_T}{A_B}\right) \leftarrow \left(\frac{\frac{A_0}{a_1^T}}{A_2}\right), \quad \left(\begin{array}{c|c} B_L & B_R \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} B_0 & b_1 & B_2 \end{array}\right)$$

endwhile

```
function [ B_out ] = Transpose_unb_var2( A, B )

  [ AT, ...
    AB ] = FLA_Part_2x1( A, ...
                         0, 'FLA_TOP' );

  [ BL, BR ] = FLA_Part_1x2( B, ...
                             0, 'FLA_LEFT' );

  while ( size( AT, 1 ) < size( A, 1 ) )

    [ A0, ...
      a1t, ...
      A2 ] = FLA_Repart_2x1_to_3x1( AT, ...
                                    AB, ...
                                    1, 'FLA_BOTTOM' );

    [ B0, b1, B2 ]= FLA_Repart_1x2_to_1x3( BL, BR, ...
                                           1, 'FLA_RIGHT' );

    %------------------------------------------------------------%

    b1 = laff_copy( a1t, b1 );

    %------------------------------------------------------------%

    [ AT, ...
      AB ] = FLA_Cont_with_3x1_to_2x1( A0, ...
                                       a1t, ...
                                       A2, ...
                                       'FLA_TOP' );

    [ BL, BR ] = FLA_Cont_with_1x3_to_1x2( B0, b1, B2, ...
                                           'FLA_LEFT' );

  end

  B_out = [ BL, BR ];

return
```

☛ Click to view .m file Transpose_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SYMMETRIZE\_FROM\_LOWER\_TRIANGLE\_UNB\_VAR1}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{01} := (a_{10}^T)^T$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Symmetrize_from_lower_triangle_unb_var1( A )

  [ ATL, ATR,  ...
    ABL, ABR ] = FLA_Part_2x2( A,  ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,   a01,     A02,   ...
      a10t,  alpha11, a12t,  ...
      A20,   a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR,  ...
                                                     ABL, ABR,  ...
                                                     1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a01 = laff_copy( a10t, a01 );

    %------------------------------------------------------------%

    [ ATL, ATR,  ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,   a01,     A02,   ...
                                             a10t,  alpha11, a12t,  ...
                                             A20,   a21,     A22,   ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Symmetrize_from_lower_triangle_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SYMMETRIZE\_FROM\_LOWER\_TRIANGLE\_UNB\_VAR2}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{12}^T := a_{21}^T$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Symmetrize_from_lower_triangle_unb_var2( A )

  [ ATL, ATR,  ...
    ABL, ABR ] = FLA_Part_2x2( A,  ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,   a01,     A02,   ...
      a10t,  alpha11, a12t,  ...
      A20,   a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR,  ...
                                                     ABL, ABR,  ...
                                                     1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a12t = laff_copy( a21, a12t );

    %------------------------------------------------------------%

    [ ATL, ATR,  ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,   a01,     A02,   ...
                                             a10t,  alpha11, a12t,  ...
                                             A20,   a21,     A22,   ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Symmetrize_from_lower_triangle_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SYMMETRIZE\_FROM\_UPPER\_TRIANGLE\_UNB\_VAR1}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{10}^T := a_{01}^T$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Symmetrize_from_upper_triangle_unb_var1( A )

  [ ATL, ATR,  ...
    ABL, ABR ] = FLA_Part_2x2( A,  ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,   a01,     A02,   ...
      a10t,  alpha11, a12t,  ...
      A20,   a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR,  ...
                                                     ABL, ABR,  ...
                                                     1, 1, 'FLA_BR' );

    %------------------------------------------------------------%

    a10t = laff_copy( a01, a10t );

    %------------------------------------------------------------%

    [ ATL, ATR,  ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,   a01,     A02,   ...
                                             a10t,  alpha11, a12t,  ...
                                             A20,   a21,     A22,   ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Symmetrize_from_upper_triangle_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $[A] := \text{SYMMETRIZE\_FROM\_UPPER\_TRIANGLE\_UNB\_VAR2}(A)$

Partition

$$A \rightarrow \left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right)$$

where A_{TL} is 0×0

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

Repartition

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \rightarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

where α_{11} is 1×1

$a_{21} = (a_{12}^T)^T$

Continue with

$$\left(\begin{array}{c|c} A_{TL} & A_{TR} \\ \hline A_{BL} & A_{BR} \end{array}\right) \leftarrow \left(\begin{array}{c|c|c} A_{00} & a_{01} & A_{02} \\ \hline a_{10}^T & \alpha_{11} & a_{12}^T \\ \hline A_{20} & a_{21} & A_{22} \end{array}\right)$$

endwhile

```
function [ A_out ] = Symmetrize_from_upper_triangle_unb_var2( A )

  [ ATL, ATR,  ...
    ABL, ABR ] = FLA_Part_2x2( A,  ...
                               0, 0, 'FLA_TL' );

  while ( size( ATL, 1 ) < size( A, 1 ) )

    [ A00,   a01,     A02,   ...
      a10t,  alpha11, a12t,  ...
      A20,   a21,     A22 ] = FLA_Repart_2x2_to_3x3( ATL, ATR,  ...
                                                     ABL, ABR,  ...
                                                     1, 1, 'FLA_BR' );

    %-------------------------------------------------------------%

    a21 = laff_copy( a12t, a21 );

    %-------------------------------------------------------------%

    [ ATL, ATR,  ...
      ABL, ABR ] = FLA_Cont_with_3x3_to_2x2( A00,   a01,     A02,   ...
                                             a10t,  alpha11, a12t,  ...
                                             A20,   a21,     A22,   ...
                                             'FLA_TL' );

  end

  A_out = [ ATL, ATR
            ABL, ABR ];

return
```

☛ Click to view .m file Symmetrize_from_upper_triangle_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $y := \text{MVMULT\_N\_UNB\_VAR1}(A, x, y)$

Partition

$$A \rightarrow \left(\frac{A_T}{A_B}\right), \; y \rightarrow \left(\frac{y_T}{y_B}\right)$$

where A_T is $0 \times n$ and y_T is 0×1

while $m(A_T) < m(A)$ **do**

Repartition

$$\left(\frac{A_T}{A_B}\right) \rightarrow \left(\frac{\frac{A_0}{a_1^T}}{A_2}\right), \; \left(\frac{y_T}{y_B}\right) \rightarrow \left(\frac{\frac{y_0}{\psi_1}}{y_2}\right)$$

where a_1 is a row

$\psi_1 := a_1^T x + \psi_1$

Continue with

$$\left(\frac{A_T}{A_B}\right) \leftarrow \left(\frac{\frac{A_0}{a_1^T}}{A_2}\right), \; \left(\frac{y_T}{y_B}\right) \leftarrow \left(\frac{\frac{y_0}{\psi_1}}{y_2}\right)$$

endwhile

```
function [ y_out ] = mvmult_n_unb_var1( A, x, y )

  [ AT, ...
    AB ] = FLA_Part_2x1( A, ...
                         0, 'FLA_TOP' );

  [ yT, ...
    yB ] = FLA_Part_2x1( y, ...
                         0, 'FLA_TOP' );

  while ( size( AT, 1 ) < size( A, 1 ) )

    [ A0, ...
      a1t, ...
      A2 ] = FLA_Repart_2x1_to_3x1( AT, ...
                                    AB, ...
                                    1, 'FLA_BOTTOM' );

    [ y0, ...
      psi1, ...
      y2 ] = FLA_Repart_2x1_to_3x1( yT, ...
                                    yB, ...
                                    1, 'FLA_BOTTOM' );

    %------------------------------------------------------------%

    psi1 = laff_dots( a1t, x, psi1 );

    %------------------------------------------------------------%

    [ AT, ...
      AB ] = FLA_Cont_with_3x1_to_2x1( A0, ...
                                       a1t, ...
                                       A2, ...
                                       'FLA_TOP' );

    [ yT, ...
      yB ] = FLA_Cont_with_3x1_to_2x1( y0, ...
                                       psi1, ...
                                       y2, ...
                                       'FLA_TOP' );

  end

  y_out = [ yT
            yB ];

return
```

☛ Click to view .m file mvmult_n_unb_var1.m. Then copy and paste it into PictureFlame to watch it in action.

Algorithm: $y := \text{MVMULT\_N\_UNB\_VAR2}(A, x, y)$

Partition

$$A \rightarrow \left(A_L \middle| A_R \right), \; x \rightarrow \left(\frac{x_T}{x_B} \right)$$

where A_L is $m \times 0$ and x_T is 0×1

while $m(x_T) < m(x)$ **do**

Repartition

$$\left(A_L \middle| A_R \right) \rightarrow \left(A_0 \middle| a_1 \middle| A_2 \right), \; \left(\frac{x_T}{x_B} \right) \rightarrow \left(\frac{x_0}{\frac{\chi_1}{x_2}} \right)$$

where a_1 is a column

$y := \chi_1 a_1 + y$

Continue with

$$\left(A_L \middle| A_R \right) \leftarrow \left(A_0 \middle| a_1 \middle| A_2 \right), \; \left(\frac{x_T}{x_B} \right) \leftarrow \left(\frac{x_0}{\frac{\chi_1}{x_2}} \right)$$

endwhile

```
function [ y_out ] = mvmult_n_unb_var2( A, x, y )

  [ AL, AR ] = FLA_Part_1x2( A, ...
                             0, 'FLA_LEFT' );

  [ xT, ...
    xB ] = FLA_Part_2x1( x, ...
                         0, 'FLA_TOP' );

  while ( size( AL, 2 ) < size( A, 2 ) )

    [ A0, a1, A2 ]= FLA_Repart_1x2_to_1x3( AL, AR, ...
                                           1, 'FLA_RIGHT' );

    [ x0, ...
      chi1, ...
      x2 ] = FLA_Repart_2x1_to_3x1( xT, ...
                                    xB, ...
                                    1, 'FLA_BOTTOM' );

    %-------------------------------------------------------------%

    y = laff_axpy( chi1, a1, y );

    %-------------------------------------------------------------%

    [ AL, AR ] = FLA_Cont_with_1x3_to_1x2( A0, a1, A2, ...
                                           'FLA_LEFT' );

    [ xT, ...
      xB ] = FLA_Cont_with_3x1_to_2x1( x0, ...
                                       chi1, ...
                                       x2, ...
                                       'FLA_TOP' );

  end

  y_out = y;

return
```

☛ Click to view .m file mvmult_n_unb_var2.m. Then copy and paste it into PictureFlame to watch it in action.