Shear

Shift rows or columns of image by linearly varying offset

Library

Geometric Transformations

Description

The Shear block shifts the rows or columns of an image by a gradually increasing distance left or right or up or down.  

Note  This block supports intensity and color images on its ports.

<table>
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</table>
| Image | M-by-N matrix of intensity values or an M-by-N-by-P color video signal where P is the number of color planes | • Double-precision floating point  
• Single-precision floating point  
• Fixed point  
• 8-, 16-, 32-bit signed integer  
• 8-, 16-, 32-bit unsigned integer | No |
| S    | Two-element vector that represents the number of pixels by which you want to shift your first and last rows or columns | Same as I port | No |
| Output | Shifted image | Same as I port | No |

If the data type of the input to the I port is floating point, the input to the S port of this block must be the same data type. Also, the block output is the same data type.

Use the Shear direction parameter to specify whether you want to shift the rows or columns. If you select Horizontal, the first row has an offset equal to the first element of the Row/column shear values [first last] vector. The following rows have an offset that linearly increases up to the value you enter for the last element of the Row/column shear values [first last] vector. If you select Vertical, the first column has an offset equal to the first element of the Row/column shear values [first last] vector. The following columns have an offset that linearly increases up to the value you enter for the last element of the Row/column shear values [first last] vector.

Use the Output size after shear parameter to specify the size of the sheared image. If you select Full, the block outputs a matrix that contains the entire sheared image. If you select Same as input image, the block outputs a matrix that is the same size as the input image and contains the top-left portion of the sheared image. Use the Background fill value parameter to specify the pixel values outside the image.

Use the Shear values source parameter to specify how to enter your shear parameters. If you select Specify via dialog, the Row/column shear values [first last] parameter appears in the dialog box. Use this parameter to enter a two-element vector that represents the number of pixels by which you want to shift your first and last rows or columns. For example, if for the Shear direction parameter you select Horizontal and, for the Row/column shear values [first last] parameter, you enter [50 150], the block moves the top-left corner 50 pixels to the right and the bottom left corner of the input image 150 pixels to the right. If you want to move either corner to the left, enter negative values. If for the Shear direction parameter you select Vertical and, for the Row/column shear values [first last] parameter, you enter [-10 50], the block moves the top-left corner 10 pixels up and the top right corner 50 pixels down. If you want to move either corner down, enter positive values.

Use the Interpolation method parameter to specify which interpolation method the block uses to shear the image. If you select Nearest neighbor, the block uses the value of the nearest pixel for the new pixel value. If you select Bilinear, the new pixel value is the weighted average of the two nearest pixel values. If you select Bicubic, the
new pixel value is the weighted average of the four nearest pixel values.

The number of pixels the block considers affects the complexity of the computation. Therefore, the nearest-neighbor interpolation is the most computationally efficient. However, because the accuracy of the method is proportional to the number of pixels considered, the bicubic method is the most accurate. For more information, see Geometric Transformation Interpolation Methods in the Video and Image Processing Blockset User's Guide.

If, for the Shear values source parameter, you select Input port, the S port appears on the block. At each time step, the input to the S port must be a two-element vector that represents the number of pixels by which to shift your first and last rows or columns.

If, for the Output size after shear parameter, you select Full, and for the Shear values source parameter, you select Input port, the Maximum shear value parameter appears in the dialog box. Use this parameter to enter a real, scalar value that represents the maximum number of pixels by which to shear your image. The block uses this parameter to determine the size of the output matrix. If any input to the S port is greater than the absolute value of the Maximum shear value parameter, the block saturates to the maximum value.

**Fixed-Point Data Types**

The following diagram shows the data types used in the Shear block for bilinear interpolation of fixed-point signals.

You can set the product output, accumulator, and output data types in the block mask.

**Dialog Box**

The Main pane of the Shear dialog box appears as shown in the following figure.
Shear direction
Specify whether you want to shift the rows or columns of the input image. Select Horizontal to linearly increase the offset of the rows. Select Vertical to steadily increase the offset of the columns.

Output size after shear
Specify the size of the sheared image. If you select Full, the block outputs a matrix that contains the sheared image values. If you select Same as input image, the block outputs a matrix that is the same size as the input image and contains a portion of the sheared image.

Shear values source
Specify how to enter your shear parameters. If you select Specify via dialog, the Row/column shear values [first last] parameter appears in the dialog box. If you select Input port, port S appears on the block. The block uses the input to this port at each time step as your shear value.

Row/column shear values [first last]
Enter a two-element vector that represents the number of pixels by which to shift your first and last rows or columns. This parameter is visible if, for the Shear values source parameter, you select Specify via dialog.

Maximum shear value
Enter a real, scalar value that represents the maximum number of pixels by which to shear your image. This parameter is visible if, for the Output size after shear parameter, you select Full and, for the Shear values source parameter, you select Input port.

Background fill value
Specify a value for the pixels that are outside the image.

Interpolation method
Specify which interpolation method the block uses to shear the image. If you select Nearest neighbor, the block uses the value of one nearby pixel for the new pixel value. If you select Bilinear, the new pixel value is the weighted average of the two nearest pixel values. If you select Bicubic, the new pixel value is the weighted average of the four nearest pixel values.

The Fixed-point pane of the Shear dialog box appears as shown in the following figure.

**Rounding mode**
Select the **rounding mode** for fixed-point operations.

**Overflow mode**
Select the overflow mode for fixed-point operations.

**Shear values**
Choose how to specify the word length and the fraction length of the shear values.

- **Same word length as input**: When you select **Same word length as input**, the word length of the shear values match that of the input to the block. In this mode, the fraction length of the shear values is automatically set to the binary-point only scaling that provides you with the best precision possible given the value and word length of the shear values.
- **Specify word length**: When you select **Specify word length**, you can enter the word length of the shear values, in bits. The block automatically sets the fraction length to give you the best precision.
- **Binary point scaling**: When you select **Binary point scaling**, you can enter the word length and the fraction length of the shear values, in bits.
- **Slope and bias scaling**: When you select **Slope and bias scaling**, you can enter the word length, in bits, and the slope of the shear values. The bias of all signals in the Video and Image Processing Blockset blocks is 0.
This parameter is visible if, for the **Shear values source** parameter, you select *Specify via dialog*.

### Product output

As depicted in the previous figure, the output of the multiplier is placed into the product output data type and scaling. Use this parameter to specify how to designate this product output word and fraction lengths.

- **When you select** *Same as first input*, these characteristics match those of the first input to the block at the I port.
- **When you select** *Binary point scaling*, you can enter the word length and the fraction length of the product output, in bits.
- **When you select** *Slope and bias scaling*, you can enter the word length, in bits, and the slope of the product output. The bias of all signals in the Video and Image Processing Blockset blocks is 0.

### Accumulator

As depicted in the previous figure, inputs to the accumulator are cast to the accumulator data type. The output of the adder remains in the accumulator data type as each element of the input is added to it. Use this parameter to specify how to designate this accumulator word and fraction lengths.

- **When you select** *Same as product output*, these characteristics match those of the product output.
- **When you select** *Same as first input*, these characteristics match those of the first input to the block at the I port.
- **When you select** *Binary point scaling*, you can enter the word length and the fraction length of the accumulator, in bits.
- **When you select** *Slope and bias scaling*, you can enter the word length, in bits, and the slope of the accumulator. The bias of all signals in the Video and Image Processing Blockset blocks is 0.

### Output

Choose how to specify the word length and fraction length of the output of the block:

- **When you select** *Same as first input*, these characteristics match those of the first input to the block at the I port.
- **When you select** *Binary point scaling*, you can enter the word length and the fraction length of the output, in bits.
- **When you select** *Slope and bias scaling*, you can enter the word length, in bits, and the slope of the output. The bias of all signals in the Video and Image Processing Blockset blocks is 0.

### References

See Also

- **Resize** Video and Image Processing Blockset software
- **Rotate** Video and Image Processing Blockset software
- **Translate** Video and Image Processing Blockset software

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