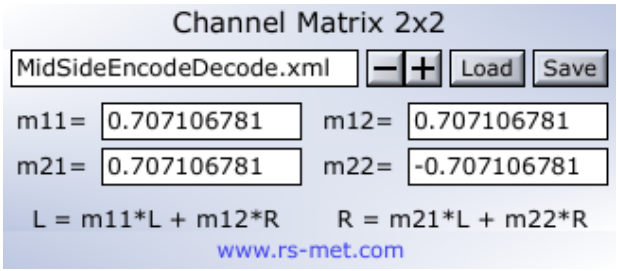
Channel Matrix 2x2 - User Manual



What is Channel Matrix 2x2?

Channel Matrix 2x2 is a plugin which lets you matrix-multiply the signals of two input channels in order to obtain another two signals which will appear at the two output channels. Example uses are mid/side encoding/decoding, mixing stereo to mono, switching channels left for right, boosting or attenuating signals, inverting signal polarity, etc.

How does it work?

The plugin has two input channels and two output channels which typically carry signals for the left and right channel of a stereo signal. Therefore, let's call the input signals x_L and x_R respectively and similarly let's call the output signals y_L and y_R. The idea is now very simple: the signal of each output channel is obtained by weighted sums of the two input channels like this:

$$y_L = m_{11} \cdot x_L + m_{12} \cdot x_R$$
$$y_R = m_{21} \cdot x_L + m_{22} \cdot x_R$$

where the $m_{11}, m_{12}, m_{21}, m_{22}$ are some arbitrary numbers which can be entered by the user. If you are familiar with the notation of matrix multiplication, you will recognize that these two weighted sums can be expressed as the matrix vector product:

$$\mathbf{y} = \mathbf{M} \cdot \mathbf{x} \tag{1}$$

when we define:

$$\mathbf{y} = \begin{pmatrix} y_L \\ y_R \end{pmatrix}, \qquad \mathbf{M} = \begin{pmatrix} m_{11} & m_{12} \\ m_{21} & m_{22} \end{pmatrix}, \qquad \mathbf{x} = \begin{pmatrix} x_L \\ x_R \end{pmatrix}, \tag{2}$$

which is why the plugin is named as it is. If you are not familiar with matrix multiplication, forget about this mumbo-jumbo and simply stick to the weighted sum explanation above. For example if we choose $m_{11} = 2, m_{12} = 0, m_{21} = 0, m_{22} = 2$, we yield a signal boost by factor 2. If we now invert the the sign of both 2s, we additionally invert polarity. With $m_{11} = 0, m_{12} = 1, m_{21} = 1, m_{22} = 0$, we could swap left and right channels. Despite the apparent simplicity of the approach, it turns out to be very flexible (due to its generality) and allows for a lot of meaningful channel manipulations.