Conversion of a Stereo Pair to Anaglyph with the Least-Squares Projection Method
Eric Dubois, March 2009

Input: Left and right views in RGB mode, assumed to be sRGB.

$$I_L^{'} = \{R_L^{'}, G_L^{'}, B_L^{'}\}, \quad I_R^{'} = \{R_R^{'}, G_R^{'}, B_R^{'}\}$$

Assume values between 0 and 1.

Step 1: Convert to linear RGB by applying sRBG gamma (if needed).

$$I_L = \{R_L, G_L, B_L\}, \quad I_R = \{R_R, G_R, B_R\}$$

$$S = \begin{cases} \left(\dfrac{S'}{12.92}\right) & \text{if } S' \le 0.04045 \\ \left(\dfrac{S'+0.055}{1.055}\right)^{2.4} & \text{if } S' > 0.04045 \end{cases}$$

Step 2: Convert to linear anaglyph I_A. Matrices designed for red/cyan glasses and CRT/plasma display.

$$I_{A=} \begin{bmatrix} R_A \\ G_A \\ B_A \end{bmatrix} = \begin{bmatrix} 0.437 & 0.449 & 0.164 \\ -0.062 & -0.062 & -0.024 \\ -0.048 & -0.050 & -0.017 \end{bmatrix} \begin{bmatrix} R_L \\ G_L \\ B_L \end{bmatrix} + \begin{bmatrix} -0.011 & -0.032 & -0.007 \\ 0.377 & 0.761 & 0.009 \\ -0.026 & -0.093 & 1.234 \end{bmatrix} \begin{bmatrix} R_R \\ G_R \\ B_R \end{bmatrix}$$

The first and second terms should be clipped to [0,1] before adding.

Step 3: Convert the anaglyph back to sRGB by applying gamma correction to get $I_A^{'}$ using:

$$S' = \begin{cases} 12.92S & \text{if } S \le .0031308 \\ 1.055 S^{0.41666} - 0.055 & \text{if } S > .0031308 \end{cases}$$

In Photoshop:
1. Input the left and right original images. Apply sRGB gamma using `Image – Adjustments – Curves – load (sRGBgamma.acv)` to both.
2. Select the left image. Select `Image – Adjustments – Channel mixer.` For each of RGB Output Channel, enter the three values from the corresponding row in the left matrix above, times 100. For Red, enter 44, 45, 16, for Green, -6, -6, -2, for Blue, -5, -5, -2

Select right image. Same as above. For Red, enter -1, -3, -1, For Green, 38, 76, 1, for Blue, -3, -9, 123.

Add them using image -- apply image: Source: right, channel RGB, Target: left, blending: add, scale 1, offset 0. (or left – right)
3. Apply sRGB gamma correction to the output anaglyph using `Image – Adjustments – Curves – load (sRGBgammaCorr.acv).` Save result.