Adjusting the Disparity of Stereoscopic 3D Media in Post Production

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Figure 1: *Red-cyan anaglyph 3D images. Left: difficult-to-fuse original with a large parallax/disparity and range of depth. Middle: disparities reduced by half. Right: non-uniform reduction of disparities adjusts uncomfortable parallax more than others.*

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1 Introduction

Selecting the convergence point and interaxial distance before the production of stereoscopic 3D media presents several challenges. There are few tools for previsualizing or validating model calculations, so estimating these parameters to match an intended shot relies on costly experience, intuition and iteration. Poor selection of these parameters can also cause or amplify viewer discomfort [Mendiburu 2009]. Figure 1 illustrates the relationship between discomfort and disparity (input images by Scharstein and Pal [2007]).

Some of this discomfort can be avoided by correcting the convergence point in post-production (post) by horizontally shifting the right-side view, but there are no methods to adjust the disparity *in isolation* for poorly selected interaxial distances. Consequently, shots that exhibit an uncomfortable disparity present a difficult and costly choice: retake the shot, scrap it altogether, or ignore viewer discomfort and green-light it for post. The shot may also be reconstructed in post with better parameters by upconverting one of the stereo pair's views to 3D, but many productions shun this approach because of the extra cost and potential compromise in artistic quality. We present a fast, simple method for adjusting disparity in post using only the stereoscopic pair and disparity map.

2 Method

Horizontal view shifting reduces the uncomfortable disparity but also moves the convergence point without regard to artistic intent. Shifting also leaves the range of depth fixed, so disparity reduction at one end of the range increases it at the other. Our approach, based on the consistent stylization method by Northam et al. [2013], allows fixed convergence points and adjustable range of depth.

First, decompose the left and right views (L, R) into merged layers M_d of all pixels with disparity d. Note that the merged view M_d is wider than the left/right views since it has dimension $(width + d, height)$. Then adjust the disparity of layer M_d:

1. Let d' be the desired disparity (e.g., a function of the initial disparity, $d' = d/2$).
2. The adjusted left layer view L'_d is formed by the pixels of M_d in the region $(d', width + d') \times (0, height)$.
3. The adjusted right layer view R'_d is formed by the pixels of M_d in the region $(2d', width + 2d') \times (0, height)$.

Once the disparities have been adjusted for each of the M_d, combine all layer views L'_d, R'_d into the respective left and right views L', R'. Occluded surfaces in L or R may produce empty regions (holes) in L', R' that can be in-painted [Wang et al. 2008].

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