A supplementary materials for
A Perceptual Model for Disparity

Piotr Didyk[1] Tobias Ritschel[2,3] Elmar Eisemann[2] Karol Myszkowski[1] Hans-Peter Seidel[1]

[1]MPI Informatik [2]Télécom ParisTech [3]Intel Visual Computing Institute

1 Different Stereo Equipment

In our work we considered three different stereo technologies: shutter and anaglyph glasses as well as auto-stereoscopic display. Figs. 1 and 2 summarize the obtained data for each type of the equipment in our discrimination threshold experiments. For each set of data we fit the discrimination threshold function, which is denoted as d_s, d_{ag}, d_{as} for shutter glasses, anaglyph and auto-stereoscopic display respectively:

$$\Delta d_s(f,a) = 0.2978 + 0.0508\,a + 0.5047\,\log_{10}(f) + 0.002987\,a^2 + 0.002588\,a\log_{10}(f) + 0.6456\,\log^2_{10}(f).$$

$$\Delta d_{ag}(f,a) = 0.3304 + 0.01961\,a + 0.315\,\log_{10}(f) + 0.004217\,a^2 - 0.008761\,a\log_{10}(f) + 0.6319\,\log^2_{10}(f).$$

$$\Delta d_{as}(f,a) = 0.4223 + 0.007576\,a + 0.5593\,\log_{10}(f) + 0.0005623\,a^2 - 0.03742\,a\log_{10}(f) + 0.7114\,\log^2_{10}(f).$$

where f is a frequency and a is an amplitude of disparity corrugation.

1.1 Discussion

For all devices the minimum disparity sensitivity was found for ~0.4 cpd, which agrees with previous studies [Bradshaw and Rogers 1999]. In the paper we demonstrate applications considering shutter glasses as this is the most commonly used solution (cf. Fig. 1). Although for anaglyph glasses we got higher detection thresholds (cf. Fig. 2) overall the shape of discrimination threshold functions for larger disparity magnitudes, is similar as for shutter glasses.

Measurements for auto-stereoscopic display revealed large differences with respect to shutter and anaglyph glasses. This, we think, is due to much bigger discomfort, which was reported by our subjects. Also measurements for such displays are more challenging due to difficulties in low spacial frequency reproduction, which is caused by relatively big viewing distance (140 cm) that needs to be kept by a observer. The disparity sensitivity drops significantly when less than two corrugations cycles are observed due to lack of spatial integration [Howard and Rogers 2002], which might be a problem in this case. We observed that measurements for disparity corrugations of low spacial frequencies are not as consistent as for higher frequencies and they differer among subjects. Surprisingly, our experiments seem to indicate that for larger disparity magnitudes the disparity sensitivity is higher for the auto-stereoscopic display than for other stereo technologies investigated we investigated.

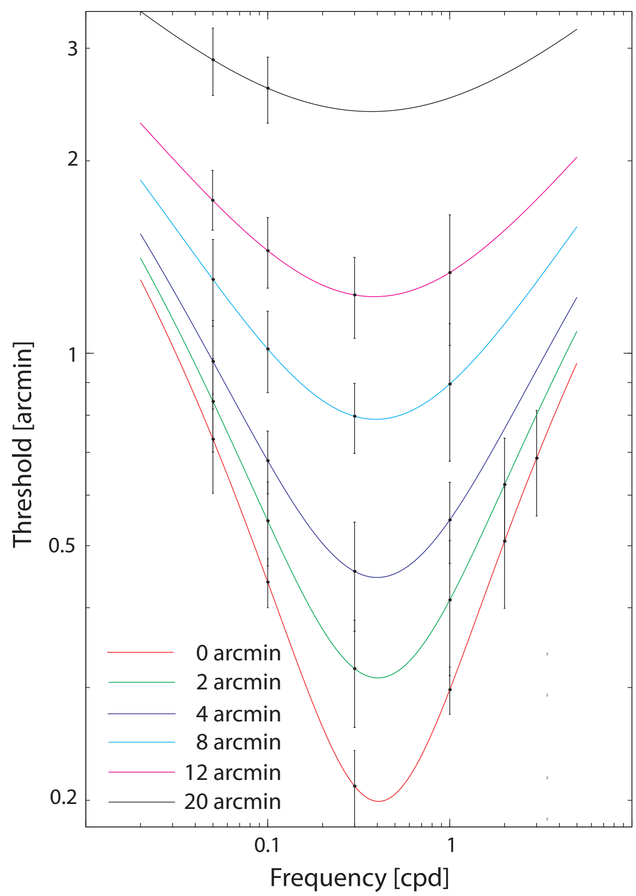

Figure 1: *Shutter glasses: Disparity detection and discrimination thresholds as a function of the spatial frequency of disparity corrugations for different corrugation amplitudes as specified in the legend. Points drawn on curves indicate the measurement samples. The error bars denote the standard error of the mean (SEM).*

References

BRADSHAW, M. F., AND ROGERS, B. J. 1999. Sensitivity to horizontal and vertical corrugations defined by binocular disparity. *Vision Res. 39*, 18, 3049–56.

HOWARD, I. P., AND ROGERS, B. J. 2002. *Seeing in Depth*, vol. 2: Depth Perception. I. Porteous, Toronto.

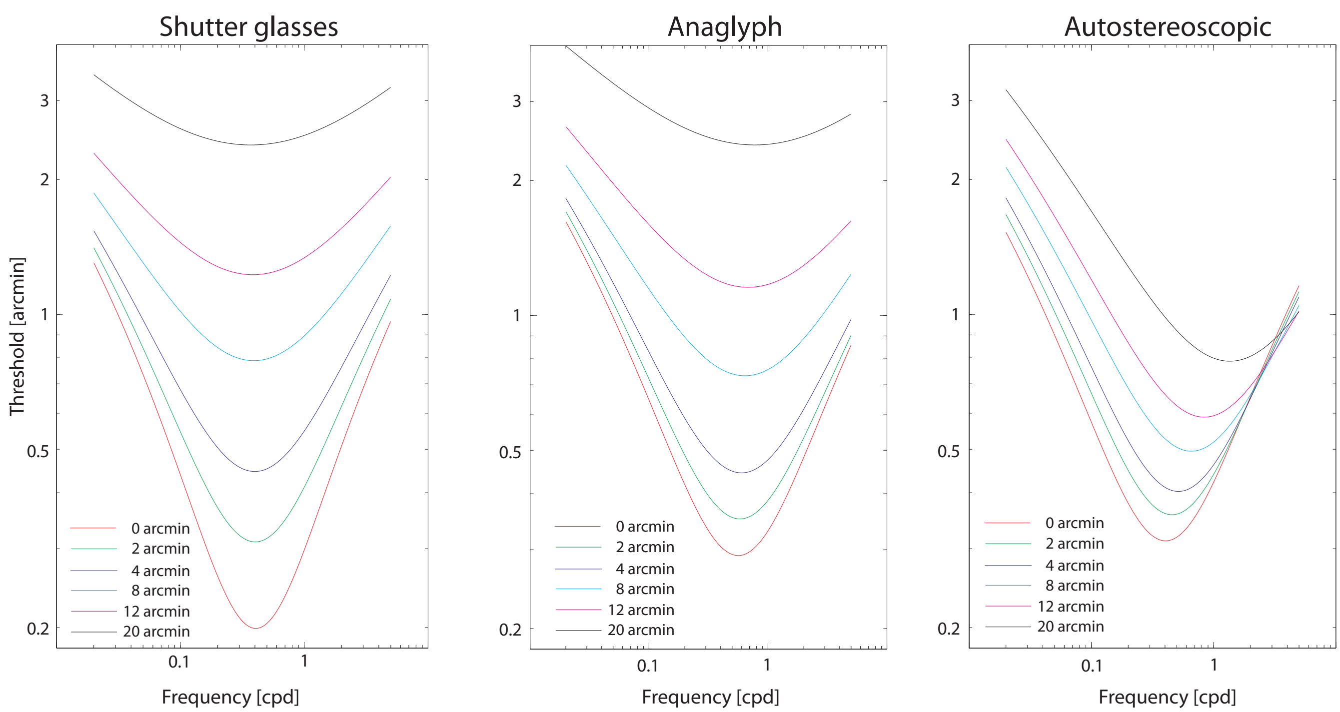

Figure 2: *Comparison of disparity detection and discrimination thresholds for three different stereo devices.*