

Supplemental Material:

Depth from HDR: Depth Induction or Increased Realism?

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Abstract

This document contains supplemental material for the paper: *Depth from HDR: Depth Induction or Increased Realism?* [Vangorp et al. 2014].

1 Experiment 2: Increased Realism

Questionnaire After the main experiment, observers were shown the real scene and told that this was the reference. To keep the duration of the experiment session reasonably short, observers were randomly assigned only one of two follow-up tasks. Fifteen observers were asked to complete this questionnaire:

1. How much experience did you have with 3D screens before this experiment? (Check all that apply.)
 - I knew that 3D screens exist
 - I watched 3D screens before (e.g., cinema)
 - I know the theory behind 3D screens
 - I've created photos, videos, or computer graphics for 3D screens
2. In the most realistic image that you saw on our screen, what needs to be improved to make it even more realistic?
3. In the most realistic image that you saw on our screen, was the *shape* of the objects the same as in the real world, or in what way was the shape distorted?
4. In the most realistic image that you saw on our screen, was the *contrast, brightness, and color* the same as in the real world, or what was different?

With Reference Observers first completed the pairwise comparison experiment without ever seeing the real scene. Then they were shown the real scene through the viewing aperture of its black box and told that this was the reference. 13 out of 28 observers were asked to repeat exactly the same experiment, this time looking at the physical scene during the experiment whenever they felt it necessary to recall how it appeared.

The results of this session with the reference were analyzed in the same way as the first session without the reference. Observers were clustered according to their selection of the most realistic interaxial distance (IAD) and contrast settings in the session *without* the reference. Figs. 2 and 3 show the results for these clusters, similarly to Figs. 6 and 7 in [Vangorp et al. 2014] but for the reduced set of observers who completed both sessions. The solid lines show how realistic the stimuli were perceived without the reference, and the dotted lines show how realistic the stimuli were perceived with the reference by the same group of observers.

Note that having access to the reference can change an observer's notion of realism. Fig. 1 shows the two most informative indicators of most realistic contrast and IAD: the peak of the contrast parabola, and the slope of the IAD line. The slope is equal to 1 when

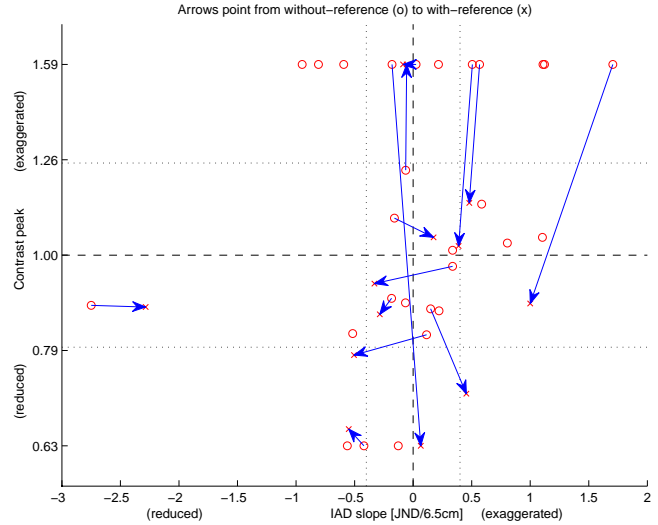


Figure 1: The most realistic interaxial distance and contrast for the observers who completed the session without the reference (\circ) and with the reference (\times). Dashed lines indicate moderate stereo (IAD slope = 0) and neutral contrast ($\gamma = 1$). Dotted lines indicate the threshold values between moderate and reduced or exaggerated along the relevant axis.

the realism score increases by 1 just-noticeable difference (JND) for the change of IAD from 0 cm (no disparity) to 6.5 cm. The results are plotted individually for each observer who took part in the session without the reference. The arrows visualize the difference the reference makes. Many arrows point towards lower contrast, indicating that observers tend to choose moderate or reduced contrast when the reference is present. Two observers who strongly preferred no stereo or exaggerated stereo were less eager to select these extremes when a reference scene was shown. The dotted lines indicate the threshold values between moderate and reduced or exaggerated along the relevant axis, but are by themselves insufficient to deduce the clusters of observers.

Fig. 4 summarizes how many observers would have crossed over into different clusters if we had clustered them according to their selection of the most realistic IAD and contrast settings in the session *with* the reference. For consistency we showed the results *without* and *with* the reference for the *same* groups of observers (clustered according to the session *without* the reference) in Figs. 2 and 3.

References

VANGORP, P., MANTIUK, R. K., BAZYLUK, B., MYSZKOWSKI, K., MANTIUK, R., WATT, S. J., AND SEIDEL, H.-P. 2014. Depth from HDR: Depth induction or increased realism? In *Proceedings of the ACM Symposium on Applied Perception*, ACM.

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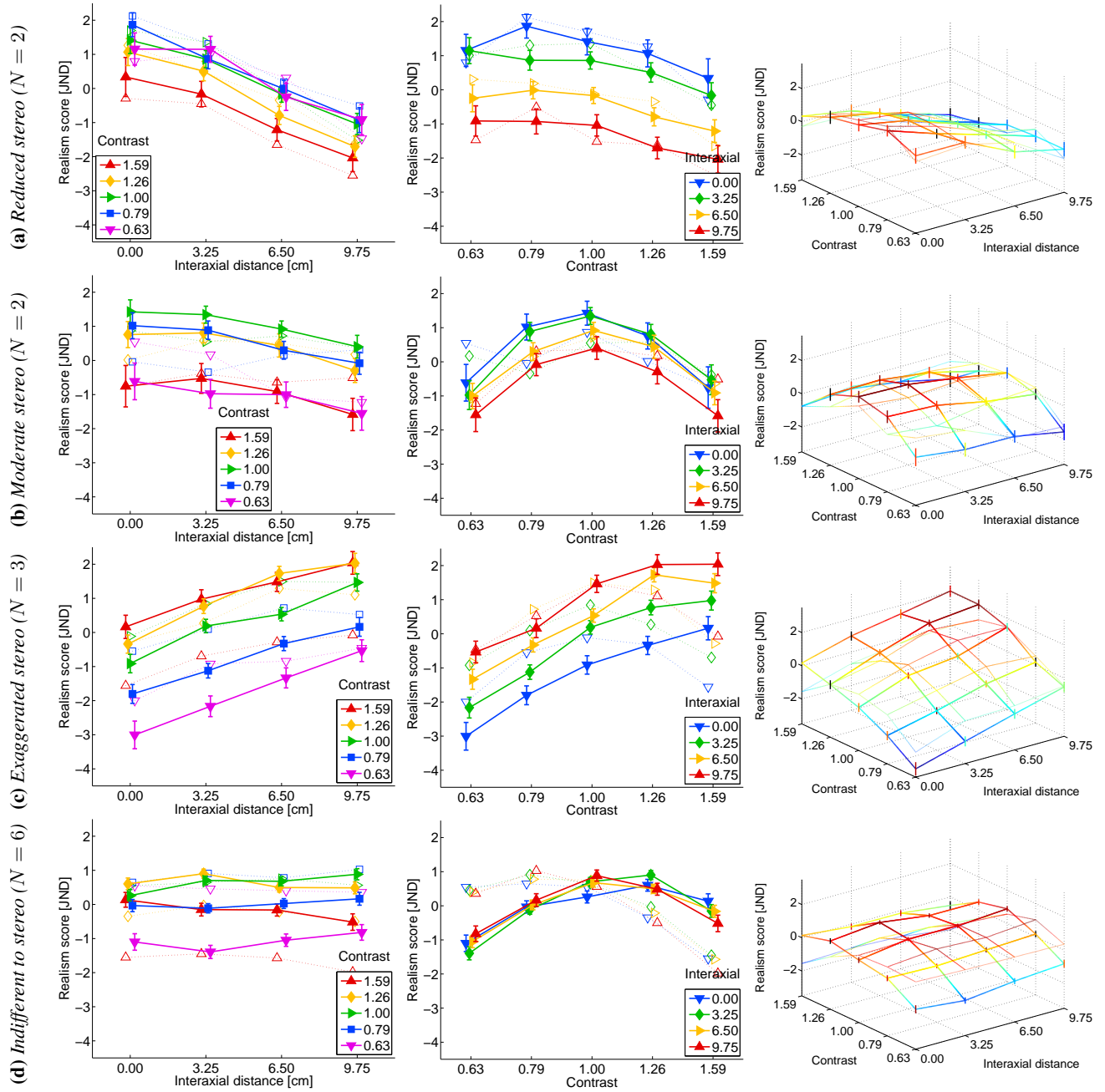
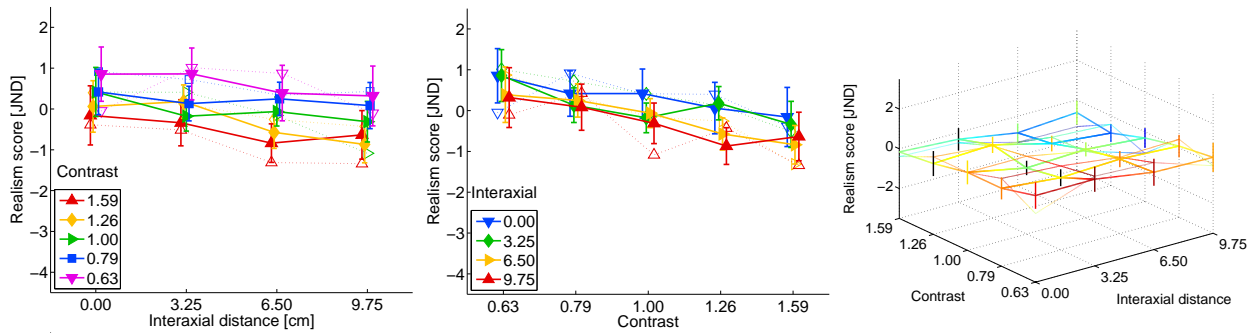
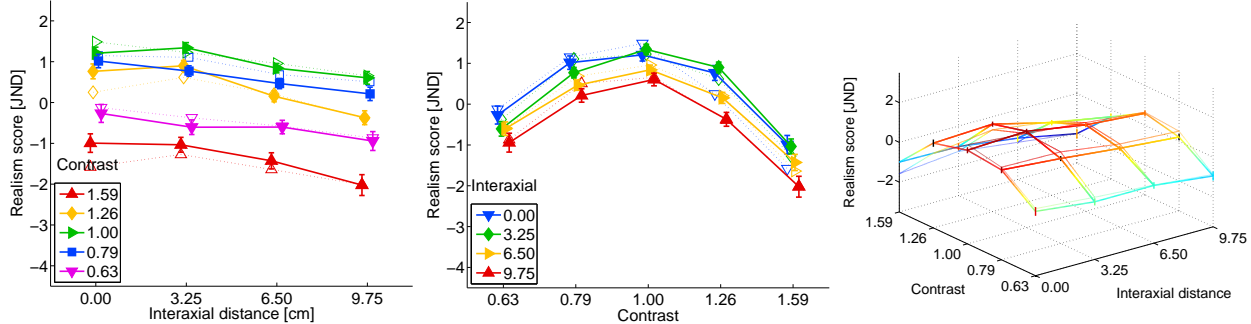


Figure 2: Results of the session without reference (solid lines) and with reference (dotted lines), averaged over observers who were clustered according to their selection of the most realistic interaxial distance (stereo) in the session without reference (rows a–d). The number N in the captions on the left indicates the number of observers that fall within each cluster. Error bars represent the standard error of the mean for the session without reference only. Realism scores in JND units are interval scales with an arbitrary zero point and cannot be compared between clusters.

(a) Reduced contrast ($N = 1$)



(b) Moderate contrast ($N = 7$)



(c) Exaggerated contrast ($N = 5$)

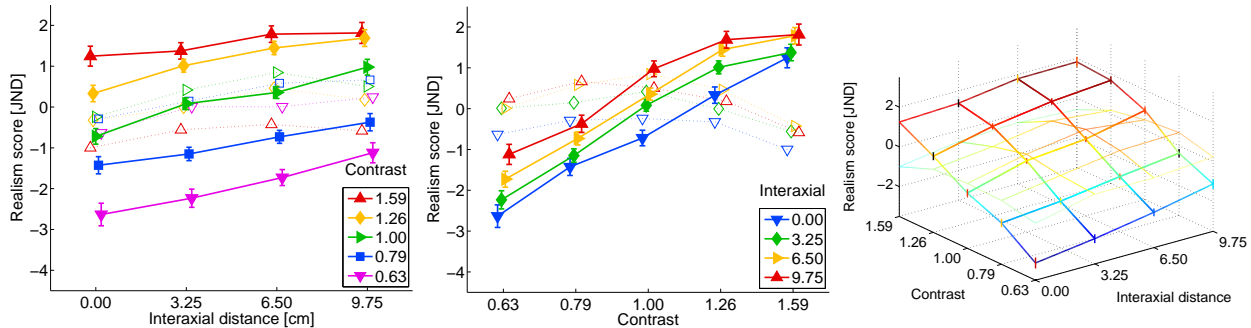
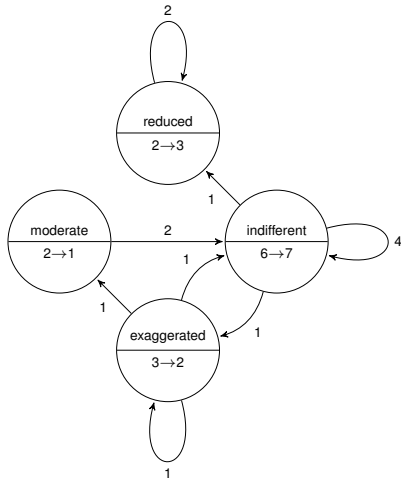
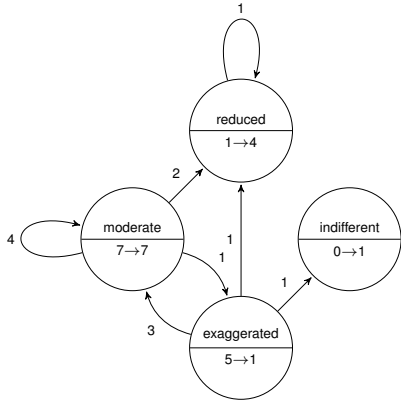


Figure 3: Results of the session without reference (solid lines) and with reference (dotted lines), averaged over observers who were clustered according to their selection of the most realistic contrast in the session without reference (rows a–c). Error bars represent the standard error of the mean for the session without reference only. Realism scores in JND units are interval scales with an arbitrary zero point and cannot be compared between clusters.



(a) IAD clusters



(b) Contrast clusters

Figure 4: Movements of observers between (a) IAD and (b) contrast clusters. Each node represents a cluster and lists the number of observers without and with reference. Each arrow represents a number of observers who crossed over between clusters. Loops indicate observers who stayed in the cluster.