Hi-lo stereo fusion presents a fully rendered image to one eye and a reduced-resolution rendering to the other. When viewed, depth and details are fused into the percept.

**Hi-lo Stereo Fusion**

We have developed a technique whereby stereo displays can be created or stored with a minimal increase in the computational resources required for single-image displays. Called hi-lo stereo fusion, these techniques present a fully rendered image of the scene to one eye and a reduced-resolution rendering of the scene to the other eye. When the two images are fused, depth is recovered from the stereo disparities available in the two images, and the details from the high-resolution image are fused into the percept such that the loss of resolution in the second image is not apparent.

Differential resolution displays can be of two sorts. First, both images can present surface boundaries; however, only one image presents surface texture. See the figure below.

![Image 1](image1.png)

The second application is depicted in the second figure. To the left is a complex high-resolution image and to the right is a stereo-appropriate rendering of the same object but at a much lower resolution. When the two images are fused, a three-dimensional object is seen based upon the disparities inherent in the low-resolution information. Moreover, the percept has a high-resolution appearance. These two techniques can be combined.

There are two reasons why differential-resolution stereo displays evoke high-resolution stereo depth percepts. First, the visual processes responsible for stereo-depth vision are driven primarily by low spatial frequency information corresponding to the low-resolution components in both images. Second, binocular rivalry is not evoked by differences in the high-resolution information. Instead, the high-resolution components of one image fuse onto the stereo-depth percept derived from the low-resolution components available in both images.

**User Study**

We conducted a user study that assessed the effect of viewing hi-lo stereo images on people's ability to fuse stereo images. Subjects played a computer game in which they shot a simulated cannon at targets displaced in depth. Number of hits was recorded over a 10-minute task period. Viewing was either biocular, hi-lo stereo, or normal hi-hi stereo. Prior to and after the task, subjects were assessed on their ability to fuse random-dot stereo images. As expected, the number of target hits was far greater for both stereo conditions relative to the biocular one. Surprisingly, subjects' performance on the stereo fusion task was improved in the hi-lo viewing condition relative to the hi-hi one. This finding indicates that hi-lo stereo viewing does not impair subsequent visual processing of normal stereo information.

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**References**


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