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Abstract Title:	**Color Perception in Stereoscopic Presentations With One Monochrome Image**
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Purpose: The ability of the human visual system to reconstruct a true 3-D image of the world using 2-D information gathered on the two flat retinas is of great utility. Stereovision has recently been utilized in real-time teleoperation applications by transmitting two, slightly offset, color images to the human operator. In an effort to reduce the required transmission bandwidth and initial hardware costs, we propose that the transmission of one color and one monochrome channel (referred to as MIX pair) will suffice to enable the human visual system to recreate a 3-D color image. The present study investigates two aspects of this hypothesis: the basic effect, i.e. will the result indeed be a stable, color, 3D image, and is there an asymmetry with respect to which eye is shown the color image.

Methods: Subjects were shown stereo pairs via either a stereoscope or a Head Mounted Display (HMD) that were either both color, both gray scale, or MIX. For each pair the subject was asked to rate on a scale from 1 to 10 the depth quality and the color quality of the perceived image. Subjects were unaware of the color content of the viewed images, which were presented in a randomized order. Three different image sets were used. All subjects were clinically tested for normal color vision and depth perception and equal visual acuity in both eyes.

Results: All subjects successfully fused the images in all image sets and using both viewing techniques. Irrespective of the color differences in a given image pair, the subjects perceived a strong 3-D image in terms of depth. Color perception was successful in all MIX cases, though some degradation of color quality was seen. When all three stimulus types are combined, 11 of the 15 subjects showed a significant preference for one eye over the other.

Conclusions: When presented with a MIX stereo pair in which one image is color and one monochrome, the human visual system will calculate the disparity information from both images in order to reconstruct a stable 3-D image while at the same time preferentially utilizing the color content of the color image to yield a slightly de-saturated color image. Presenting the color image to one ("color dominant") eye yields a more vivid result than reversing the presentation.