Magenta-Cyan Anaglyphs

Robin Lobel, January 2009

Fig 1. Magenta-Cyan glasses

Abstract

This paper present an alternative to usual anaglyph colors, by taking advantage of the low-frequency perception of blue.

1. Introduction and related works

Anaglyph images were invented in 1853 [1] and so far it has not much evolved: by using glasses with a combination of two non-overlapping colors, it filters two separate pictures from one.
Historically, the most popular color pairs are red/green and red/cyan.
The advantage of red/cyan over red/green is a better color reproduction: cyan is a mix of two primary colors (green and blue), thus combined with red all colors are reconstructed.
Other color pairs were tested, like yellow/blue (used in ColorCode 3D) [2] and green/magenta (used in Trioscopics 3D) [3].
The main problem with anaglyphs is retinal rivalry: separate colors are sent to each eyes, which can cause problems for long time viewing, and when reproducing color saturated objects.

2. The idea behind magenta-cyan anaglyphs

To reduce retinal rivalry, more chromatic information must be sent to each eye.
With current anaglyphs (red-cyan, green-magenta, yellow-blue) one eye receive one primary color, while the second receive two primary colors.
Filters don't overlap to avoid ghosting, and allow good separation of the stereoscopic pair.
However, we can take advantage of the low-frequency perception of blue by the human eye to send two primary colors per eye: if we blur blue channel only, it cause very few changes in the picture sharpness.

Fig 2. Original picture and original blue channel

Stereoscopic pair differs by horizontal parallax, so blurring horizontally (by an amount equal to average parallax) prevent eye matching the stereoscopic pair using blue channel (thus removing ghosting on blue channel), while preserving average color accuracy.

Fig 3. Picture with horizontal blur on blue channel

Once blue channel is blurred in each picture, left eye picture is filtered with magenta (red+blue) and right picture with cyan (green+blue).

3. Results

The following stereoscopic picture can be seen using magenta-cyan glasses.

Fig 4. Crysis Warhead stereoscopic picture using magenta-cyan anaglyph

4. Limitations and future development

As with conventional anaglyphs, retinal rivalry can be reduced by slightly desaturating the original colors (before applying the anaglyph process), and ghosting (caused by imperfect filters) can be reduced by removing a bit of the opposite color (here red and green) in the source pictures.
The white balance can also be adjusted to match filters density.

References

[1] http://en.wikipedia.org/wiki/Anaglyph_image
[2] http://www.colorcode3d.com/
[3] http://www.trioscopics.com/