

Enhancing Perceived Depth In Images Via Artistic Matting

Amy A. Gooch

Bruce Gooch

Northwestern University



Figure 1: *Left image features are generally perceived to lie in the image plane. Features of artistically matted image on the right are generally perceived to be non-coplanar and located behind the image plane.*

Abstract

We present a simple tutorial for the addition of artistic mattes to digital images for the purpose of enhancing the three-dimensional effect of the image. We show that artistic mattes add visual cues to an image enhancing the sense of depth in the image. We also report the results from two perception studies on matte color preferences and depth estimates in matted versus non-matted images.

1 Artistic Tradition and Image Perception

Images of three-dimensional scenes rarely convey the rich sense of depth and geometric complexity apparent when observing the real world. One reason for this is that under almost all viewing conditions, the location of the surface on which the image is rendered is apparent [Rogers 1995]. The sense of a flat picture plane conflicts with the three-dimensional information contained in the image itself. Matting is a method of separating the perceived depth of features in the image from the image surface itself. Our research into artistic matting explores only those effects which enhance the three dimensional effectiveness of the matted image. An example of an image with and without a matte is shown in Figure 1.

Image matting serves both practical and aesthetic functions. Mattes provide a method for hanging and protecting an artwork. Simultaneously, mattes are designed to either separate or harmonize the imagery from its surroundings. The borders created by mattes can contain and control the composition of the image within its boundaries. According to artistic principles the purpose of the artistic matte is to call attention to the image, not the other way around. Creating mattes calls for restraint and it is better to err on the side of simplicity [Keefe and Inch 1990].

It has long been known that the three-dimensional effect of an image can be enhanced if the image is viewed through a reduction screen or a view-box (e.g., [Ames 1925]). This effect can be demonstrated by viewing an image through a rolled up sheet of paper held to one eye while closing the other eye (“peephole viewing”). A restricted view enhances the perception of pictorial-depth information with respect to distance and size by attempting to disassociate the three-dimensional information contained in the image with the conflicting flatness information inherent in the image. Mattes simulate peephole viewing, providing cues to override the conflicting binocular stereo and motion parallax cues from the images surface. In removing these conflicting cues, the viewer is more apt to choose to perceive the illusion that the image represents a scene instead of a flat image.

2 Perceptual Experiments

We report on two preliminary experiments which examine participants color matte preferences as well as whether these artistic mattes can be shown to increase perceived depth in an image.

In order to evaluate the aesthetics of the automatic choices, we created a web-based experiment and asked participants to rank a series of different mattes on a single image in order of preference. The data we gathered indicates that automating the choice of matte color may not lend itself to a simple algorithm. However, such color choices provide users with a set of colors that they can refine to suit their own aesthetic preferences.

In our second experiment, we explored whether the matte actually affects verbal depth judgments in static images. For each source image, we selected 2 points in each of the source images. In each presentation, the point in the image at which the participant is asked to judge the depth is marked by a small black and white cross. Our stimulus is 14 source images x 2 judgment points x 2 matted/non-matted presentation. The data from this experiment potentially contradicts the idea that artistic mattes enhance the three dimensional effectiveness of the matted image. The experiment indicates that there may be a slight increase perceived depth in matted CG images, however more experiments would be needed to understand this potential phenomenon.

3 Conclusion

We have demonstrated some simple methods of enhancing computer graphics images by adding artistic mattes. Our experiments lead to some interesting results, but in order to truly understand the perceptual benefits or drawbacks of adding artistic mattes to images, further examination will be required.

References

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