



Sketchy Rendering

John Haddon
The Moving Picture Company
theboyhaddon@hotmail.com

Abstract

The animated short "a flatpack project" was intended to emulate the aesthetics of traditional art techniques in a digital medium. This necessitated the creation of custom rendering and image processing code to reproduce the appearance of line drawings in both pencil and ink, along with other effects such as the bleeding of ink in water and the application of pastel to paper. This sketch describes some of the techniques used in achieving these ends.

Overview

The bulk of the techniques used focused on the 2d post processing of images rendered from 3d scenes modelled and animated in Maya. The post process approach was largely motivated by a need to "colour outside the lines", something not easily achievable in a conventional renderer. Initial output typically comprised of depth, facing ratio and tonal information encoded in an RGB image. These intermediate images were then processed variously to provide the elements of the final animation.

Line Drawings

The first stage in the creation of line drawings was the familiar cel line generation process. Edge detection was performed on the facing ratio and depth images, yielding clean line images which required further processing to achieve the sketched look. The lines were then traced to extract a curve definition. Rather than use any of the more complex curve fitting techniques, regularly spaced samples along the lines were used to form the control points of an interpolating cardinal spline. Although less precise than more rigorous curve fitting techniques, this was adequate (and perhaps even more appropriate) for the sketchy look desired, with the tension properties of the cardinal spline proving invaluable later in the processing.

Once extracted, the cardinal splines were plotted using different styles to emulate the effect of both pencil and ink. It was found that by plotting each spline over a (very) widely varying range of tensions and combining the results, a good semblance of a pencil sketch was achievable. Higher tensioned plots tended to give a loose line, much like an initial sketch. This was then filled in with lower tensioned plots tightening to a more refined line. By controlling the range of tensions a variety of looks were achieved, with very high tensions causing straight line segments to overshoot wildly, yielding the appearance of construction lines.

In contrast, inked lines were typically plotted at a single, more sensible tension. Line width was influenced by both position along the stroke and the tonal value beneath the brush, enabling shadow areas to be more thickly delineated.

Ink bleeding

Rather than use a more complex simulated method, a very simple cellular automata rule was developed to provide the effect of ink on a wet page. The resulting greyscale images of bled ink were

enhanced by remapping through color gradients, giving the appearance of the separation of the ink. Although not having all the richness of a more complex approach (e.g [Curtis et al. 1997]), these techniques proved adequate for the job in hand.

Pastel on paper

The effect of pastel on paper was one of the more easily achieved effects. Tonal images were roughened with a paper texture, and then remapped through a gradient composed of blocks of solid colour, using a simple expression node in Chalice. Mapping the midtone transparency allows the paper to show through, preventing the page from becoming saturated with heavy colour.

Compositing

As the pastel example shows, a fair amount can be achieved through the use of simple compositing tricks. The flexibility and immediacy of the 2d application are believed to provide the best environment for considering issues of style and aesthetics. For this reason the technical processes described were used to generate a great many elements, each of which provided added flexibility in the compositing of the final image.

Conclusion

It is hoped that this sketch has shown that a combination of relatively simple computer graphics techniques can be employed along with a little thought, creativity and good fortune to produce pleasing images in the vein of traditional media.

References

CURTIS C., ANDERSON S., SEIMS J., FLEISCHER, K. AND SALESIN, D. 1997. Computer-Generated Watercolor. In *Proceedings of ACM SIGGRAPH 1997*.

