Perturbed Brush for Watercolor Painting

Hiroshi Kagawa  Yuki Morimoto  Tomoaki Moriya  Tokiichiro Takahashi
School of Science and Technology for Future Life
Tokyo Denki University
Tokyo, Japan
{ h-kagawa | yuki | moriya | toki }@vcl.im.dendai.ac.jp

Fig.1: Rendering process and another example of shading image.
(a) Non photorealistic shaded image, (b) Another example of shading image, (c) Perturbed painting by re-sampling, (d) Composite results.

Keywords—non photorealistic rendering; watercolor-like image generation; hatching; re-sampling.

I. INTRODUCTION

In a watercolor painting, we paint the inner color of 3D geometries exceeding the outline as though they have been painted roughly. We propose a watercolor-like NPR style via perturbed brush paintings, which is based method of Nienhaus et al. [1]. The generated images are impressive and look like hand painted.

II. PROPOSED METHOD

Our method consists of three steps while we apply six types of G-buffer [2] as shown in the following list. Here we define that G(X) indicates a G-buffer [2] of the rendering property X.

1. Objects’ IDs, G(id)
2. Material color components, G(R/G/B)
3. Diffuse reflection values, G(diffuse)
4. Surface normal vectors, G(N)
5. Contour values, G(contour/edge)

A. Non Photorealistic Shaded Image Generation

We extract contours and inner edges from G(N) and G(depth) of a 3D scene. We store these contours and edges to G(contour/edge). We render hatching-like shades by compositing pencil texture to the negative regions of G(diffuse). Finally, we make a composite the hatching-like shades with G(R/G/B) to generate non-realistic shaded image (Figure 1-(a)).

While Saito et al. [2] apply coordinates of latitude and longitude of each 3D object for hatching, our method is capable of various shading styles by texture mapping simply (Figure 1-(b)).

B. Perturbed Painting by Re-Sampling

Once we obtain the rendered image by Step A. Then we re-render the scene by re-sampling intensities of all rendered pixels from these original coordinates slightly perturbed by offset textures (Figure 1-(c)). We create offset textures as uncertainty values for x and y axes. While Nienhaus et al. [1] opt for a noise texture whose texel values have been determined by the Perlin noise function, we apply a diffused hatching-like textures. Also we multiply constant values for offset textures. These constants are capable to determine a direction of brush painting.

C. Composition

Finally, a watercolor-like image with exceeding contours was generated by compositing the result of the step B with the G(contour/edge), and a bump texture of drawing paper in this order (Figure 1-(d)).

III. CONCLUSIONS

We have developed a non-photorealistic rendering technique that generates watercolor-like images from rendering properties of a 3D scene. The technique enables to paint objects exceeding the outline.

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REFERENCES