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A Discussion on Computer Painting System

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1. Introduction

Nowadays, the most challenge study on computer art is to simulate the rendering effect of traditional painting materials, and to construct efficient painting systems. As a conceptual model of painting system, canvas is usually represented as a color buffer, brush turns to be the mouse, and users draw strokes directly on the display. In different systems, the strokes are rather different in formation and rendering quality. A discussion on the problems of the exiting painting systems is carried out. To illustrate a new direction for the research on computer art system, our approach on a black ink painting system is introduced.

Computer painting system, Realistic image, Sumie painting, Nijimi rendering, Interface

2. An analysis about the existing systems

The most simple stroke is made by repeatedly tamping the print of the brush along the path the brush passes through (the shapes of brushes are held as a set of pixel matrices). In Haeberli's system [1], strokes appear as points, lines, triangles, and various patterns. The most notable stroke model was proposed by Strassmann for creating black ink painting [2]. It is significant due to that for the first time the physical behavior of brush is accurately simulated. Rooted in the idea of cellular automata, Cockshott [3] and Small [4] modeled the displacement behavior of "wet paint" on the surface of a rough canvas. By "wet paint", they indicates oil, acrylic, and watercolor paints. As the characteristics of the paint, viscosity and ability to mix were considered. Although many systems considered the characteristics of painting materials, their results are only interesting but not realistic. To comparatively examine the works of artists and the results of these systems, one will see the expression of the strokes are incredible different in range, variety, and complexity. This is considered:

- Due to the most remarkable characteristic of an art style was not considered. For example, as modeling oil paintings, the glossiness of the oil paints to the studio's lights was not considered.
- Due to the sallowness of the models employed by the painting systems, the rendering is unrealistic. The system designers usually want to use one simple model to represent a wide range of effects of different art styles, but disregard the fact that every art style has its own characteristics rooted in the painting materials. For example, the canvas and the paints are physically different for oil and water-color, quality rendering is impossible when the two kinds of painting was represented by one simple model.

Therefore, to generate fine art images of realistic quality, it is necessary to have a well understanding about the art, to investigate the attributes of painting materials, and to use a reasonable rendering model.

3. A sumie-painting system

Following the above principle, a black ink painting system is developed. Black ink painting, also called "Sumie" in Japanese, is the art created by using black ink. Artists often make use of the high absorbency attribute of the paper to let ink spread out of the original boundary of a stroke, in order to form a natural, subtle, and blurred rendering. This technique is called "nijimi" in Japanese, and is considered the most remarkable feature of the art. The characteristics of this system is that it efficiently represents the nijimi rendering, and gives realistic results. This overcomes a big weakness that prevents the previous approaches from practical application. With an visual interface developed to support the drawing process, it is easy to input strokes of arbitrary formation and to render them with rich variation.

The investigation on the physical mechanism of nijimi gives rise to the idea of an physically integrated nijimi rendering model. The model can be viewed as a hierarchical cellular automata system. As illustrated by Fig.1, the model is consisted of three parts: generation of a realistic fiber mesh of painting paper, modeling the nijimi diffusion procedure to decided the delicate formation of a nijimi pattern, and decided the intensity of every points.

The painting interface includes the facilities for inputting strokes, specifying the rendering parameters, and editing an image. Besides the special drawing and rendering abilities, it includes also the functions of standard painting system. All the operations can be performed visually and interfactively. Fig.2 is an example to show the mesh sub-window. The user is able to select a prepared fiber mesh, and to produce a fiber mesh according to the current fiber length and fiber density specification. The **View** option can also graphically show the selected fiber mesh.

4. Conclusion

A discussion on the problems of the exiting painting systems is given. To illustrate a new direction for constructing computer art system, our approach on a black ink painting system is briefly introduce.

REFERENCES

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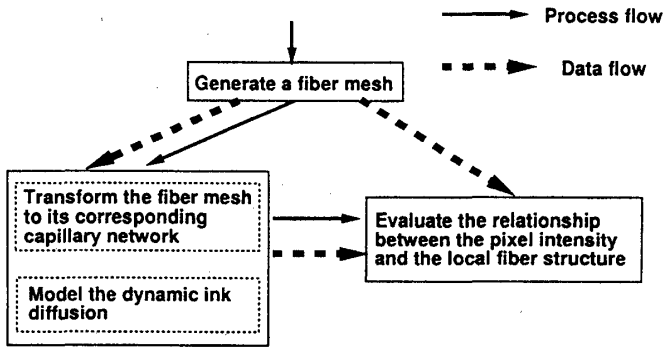

Fig.1 The construction of the integrated nijimi rendering model

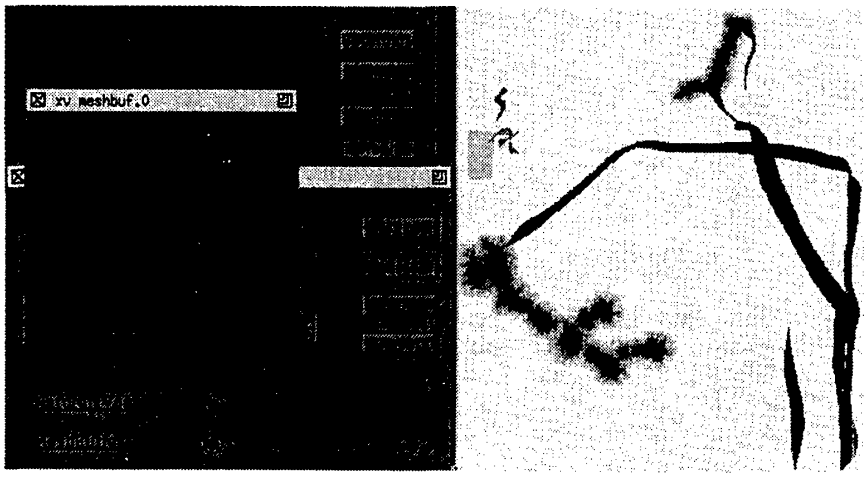

Fig.2 An example illustrating the painting interface