

# Suggestive Painterly Style Image Generation System to Satisfy User Preferences

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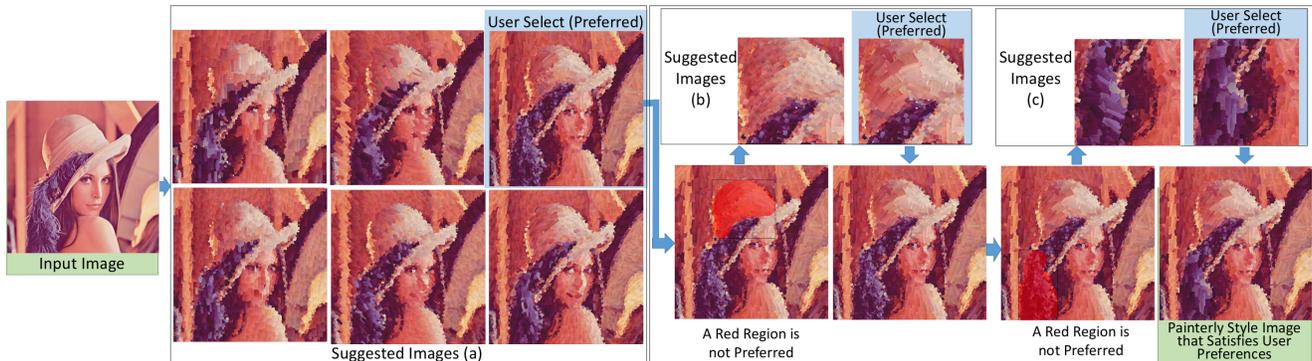


Figure 1: Workflow of proposed system.

## Abstract

In non-photorealistic rendering (NPR), an evaluated value of the rendered image is not absolute. It is different for each user. Therefore, in NPR, it is important to render an image that satisfies user preferences. Many methods of painterly style image generation have been proposed/developed. However, these methods focus on image generation that imitates painting material or a painterly style. Therefore, to the best of our knowledge, the study of how to generate a painterly style image that satisfies user preferences does not yet exist. When gazing at an image, the user is more effective at quickly identifying regions that the user dislikes than in finding preferred regions. To address this point, we propose a mechanism of painterly style rendering that satisfies user preferences.

**Keywords:** painterly style rendering, suggestive interface

**Concepts:** •Computing methodologies → Non-photorealistic rendering;

## 1 Proposed System Workflow

Figure 1 shows an example of our system workflow. The steps of this workflow are outlined below.

**Step 1:** The system generates several painterly style images from the input image by using several NPR parameters and then suggests those style images to the user. The user selects the image (the preferred process), as shown in Fig.1 (a).

**Step 2:** The user fills the regions of the image that are not preferred (the not preferred process). The system analyzes the NPR parameters within the regions and generates several images from different

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parameters, while avoiding the not preferred his parameters. The system suggests these images to the user; the user selects his most preferred image (the preferred process).

**Step 3:** If the user identifies regions that are not preferred, Step 2 is repeated. Otherwise, the user obtains the painterly style image that satisfies that users preferences.

## 2 Implementation

Our prototype system was implemented on a 2.3-GHz Intel Core i7 CPU and an NVIDIA GeForce GT 750M GPU. The system runs in real-time for all user interactions. In the system, the generation method of each painterly style image uses Haeberli's stroke-based rendering [Haeberli 1990]. The location of brushes is determined by the location of disks arranged by using Poisson disk sampling (PDS) method. The radius of the PDS method is determined by a distance map obtained from the input image. The sizes of the brushes are determined by the radii of the arranged disks. The directions of the brushes are determined by a direction map stored in a two-dimensional vector for each pixel.

In Step 1, by combining the distance maps and direction maps, the system generates painterly style images by various parameters. We calculate the distance maps by changing the different maximum threshold from distance map obtained from the input image (by changing this threshold, the brush sizes can change). We calculate the direction maps, whereby each pixel value is a random value, a fixed value (e.g., 90), and a gradient of the input image.

In Step 2 and Step 3, we first calculate the displacements with the current map in the regions not preferred by the user and the maps generated by Step 1 in those regions. Next, the current map for those regions is updated to maximum displacement map. The system generates a painterly style image based on updated the map and suggests it to the user. To generate another suggested image, the system iterates this process and employs a different map.

## 3 Results and Conclusions

Figure 2 shows the results of a user test that we conducted. Nine users participated in this test. The input image was set to the image of a model Lenna. Each user result was produced in 5 to 10 min.

Each user created a different work using Lenna. Experimental results verified that our prototype system can generate painterly style images that satisfy users preferences. Detailed analytical results are shown in Supplemental Materials.



**Figure 2:** *Examples of painterly style images produced through the proposed system.*

## References

HAEBERLI, P. 1990. Paint by numbers: Abstract image representations. In *Proceedings of the 17th Annual Conference on Computer Graphics and Interactive Techniques*, ACM, New York, NY, USA, SIGGRAPH '90, 207–214.