Classification and Image-based Rendering of Different Styles of Chinese Ink Painting

I. Introduction

Ink paintings play an important role in the cultural heritage of China. Chinese ink paintings feature a number of unique characteristics, such as (1) the physical process of water and ink diffusion and (2) the relative importance of brush strokes in conveying artistic style, that necessitate specialized image processing methods both for classification of ink paintings and image-based rendering of ink paintings. A sampling of recent research conducted in these two areas is provided in section IV.

For this project, I am interested in exploring ways of integrating the methods developed in these two subfields of research. Classification typically relies on extracting and analyzing certain features of the image to assign the image to a certain category, whereas image-based rendering seeks to reproduce the features of a given category in a newly-generated image. In some sense, these two procedures can be loosely viewed as inverse operations.

The methods that I have encountered thus far for image-based rendering typically each produce one particular style of ink painting. I would like to explore whether the methods used in classification for analyzing stylistic features could be adapted to provide parameters for image-based rendering. The goal would be an algorithm that could analyze a set of paintings from a particular artist and then perform image-based rendering in the style of that artist. The algorithm should be adaptable enough to produce a variety of styles based on the set of training paintings provided.

This project will provide opportunities to learn about existing methods in image processing, classification, and rendering. The integration of classification and rendering methods will provide an opportunity for original research.
II. Timeline

- Research (to be completed by February 12)
  - Read relevant papers and explore the methods that have been developed thus far.
  - Identify several methods to use as a starting point for this project.

- Implementation of modules (to be completed by March 11)
  - Develop a working implementation for classification of ink paintings.
  - Develop a working implementation for image-based rendering of ink paintings.

- Integration of modules (to be completed by April 22)
  - Integrate the two modules developed in the previous phase to produce the final algorithm.

- Time-permitting tasks (to be completed by May 5)
  - Web interface, user study
  - Exploration of other applications (e.g. creating a WebGL shader to render a 3D scene as an ink painting in real time)

III. Deliverables

- Source code
  - An algorithm that can (1) recognize features of different styles of Chinese ink painting and (2) subsequently render ink paintings of that style based on images supplied by the user.

- Portfolio of images
  - Paintings from different artists used to train the algorithm.
  - Images used as bases for rendering.
  - The corresponding renderings produced by the algorithm after training on each style.

- Web interface (time permitting)
  - A web framework that would allow users to run the algorithm by uploading their own training paintings and images for rendering.

- User study (time permitting)
  - Small-scale qualitative and/or quantitative user study to assess perceived degree of stylistic similarity between original paintings and those generated by the algorithm.
IV. Sample of Sources

- Classification of Ink Paintings:
  - *Monte Carlo Convex Hull Model for classification of traditional Chinese paintings*
    - Meijun Sun, Dong Zhang, Zheng Wang, Jinchang Ren, Jesse S. Jin
  - *Recognition of Chinese artists via windowed and entropy balanced fusion in classification of their authored ink and wash paintings (IWPs)*
    - Jiachuan Sheng, Jianmin Jiang

- Image-based Rendering of Ink Paintings:
  - *Real-Time Image-Based Chinese Ink Painting Rendering*
    - Lixing Dong, Shufang Lu, Xiaogang Jin
  - *A Novel Method of Converting Photograph into Chinese Ink Painting*
    - Fan Guo, Hui Peng, Jin Tang
  - *Image-based Ink Diffusion Simulation and 3D Chinese Wash-ink Paintings Rendering*
    - Da-Jin Li, Cheng-Jie Bai