Aesthetic Quality Classification of Photographs

The aesthetic quality of a photograph is a significant cue for inferring the level of appreciation that arises when people view digital content on various types of computer systems. It would be useful to classify the aesthetic quality in photographs to more easily manipulate large photograph collections that are available because of the widespread use of digital cameras and the Internet. The research community is currently tackling this challenging problem of aesthetic quality classification, which automatically assesses whether a photograph generates aesthetic appreciation.

This thesis focuses on developing techniques for classifying aesthetic quality of photographs. In particular, we discuss detecting of multiple-subject regions and assessing color harmony in order to enhance the performance of aesthetic quality classification. These techniques play an important role in determining aesthetic quality of photographs. We statistically build these quality classifiers using large photograph databases collected on websites where users manually provide quality labels to photographs. Furthermore, we demonstrate that our aesthetic quality classifier emulates how people organize large photograph collections.

The first part describes an aesthetic quality classifier with multiple subjects. First, we detect multiple-subject regions that contain attention grabbing salient pixels in a photograph. We also detect the background region. From these detected regions, we extract features that are based on the rule of thumbs for photography. We combine these features to show the relationships among multiple-subject regions and the background region. The combined features are then used for classifying the aesthetic quality of a photograph. The previous works on this topic considered only single-subject regions.

The advantage of our technique is that it can deal with photographs containing multiple subjects, for example, a flower among leaves or individual buildings in a landscape. Our technique can extract more detailed features from multiple-subject regions than from a single-subject region.

The second part describes an aesthetic quality classifier on the basis of the color harmony assessment of photographs. Color harmony plays an important role in various aspects that determine the perceived quality of a photograph; furthermore, color harmony should be taken into account to enhance the ability of automatic aesthetic quality classification. In this part, we tackle the challenging problem of evaluating the color harmony of photos, particularly for aesthetic quality classification. A key observation is that a photograph can be seen as a collection of local regions whose color variation is relatively simple. This has led us to develop a technique for assessing the aesthetic quality of a photograph on the basis of its color harmony.

In the third part, we describe applications using aesthetic quality classification. We designed a technique for automatically cropping a photograph using a quality classifier that assesses whether the cropped region is agreeable to users. We first trim the original image and then decide on the candidates for cropping. We find the cropped region with the highest quality score by applying the quality classifier to the candidates. We further demonstrate a photograph search application that has aesthetic quality classification.

Throughout these works, aesthetic quality classification that detects multiple subjects and assesses color harmony was made significantly more accurate. The proposed techniques could be used for easily manipulating large photograph collections. This enhances the potential for the future investigations of computer systems that infer human emotion and provide fast services to different people and environments, enabling these systems to interact naturally with people.