Smart Album - Photo Filtering by Effect Detections

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1 Motivation

With digital cameras and the storage device technologies are more and more mature, people can easily take large number of pictures in one time. However, some pictures have defect and would be deleted while management, e.g., blur, too dark or too bright images. Moreover, there are also two common problems when we are managing the photos. One is the orientation problem that we always need to rotate the photo if it is not upright, and the other is about duplications that sometimes we will take many shots at the same place with the same viewpoint, but we just keep only one finally. Depends on image analyzing, we make a system "Smart Album" that can automatically filter these photos: blur, abnormal exposure, orientation, and duplication. Thus, users can save lots of time from picking defect pictures up or rotating them.

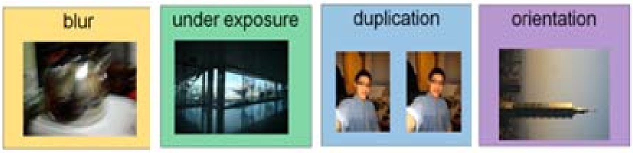

Fig 1. The four common situations for consumer photos

2 Exposure Detection

For detecting the exposure, we first uniformly divide the image into many patches, and each patch P_i has its own luminance histogram. The histogram is quantified into 16 levels, e.g., for the luminance range [0,255], the pixel is in the first level if the luminance is [0,15]. Then, r_i is used to indicate the represented level for P_i, which is the level contains the maximum number of pixels in that patch. We call P_i is *normal* exposed if r_i is in [4,11], *under* in [0,3], and *over* in [12,15]. Finally, an image labeled as *under* exposed if *under* patches is more than 2/3, so do for the *over* cases. Otherwise, *normal* is labeled to it.

The algorithm seems so naïve but work well in general cases. However, the night scenes are special cases. Even by people, it is hard to judge whether a night scene has a proper exposure or not. Hence, we use time information from the photo's metadata. If a shot is taken considering in the night and under exposure reported, it will be labeled as *night*.

3 Blur Detection

We use SVM (Support Vector Machine) to determine the image is *blur* or not. The training feature is the distribution of the gradient's direction for all pixels, and the training datasets are 140 blur images and 139 non-blur images.

4 Duplication Detection

A good way to measure two images are similar or not is using SIFT. We do the SIFT test for images taken in a short period (in 1 minute). And users also can modify the feature points matching percentage threshold from 80% to 95%. It will determine how the similarity degree would be picked.

5 Orientation Detection

It is difficult to determine the orientation for an image if we do not have any contain information about the scene. In our approach, we classify the pictures into four classes. The first class is for the pictures which have faces inside. We can get a high accuracy (>90%) result by using face detection to find an orientation has maximum faces. The second class is the pictures which have no face, but very similar to the pictures in the first class. Assuming all the pictures in the first class have already labeled for correct orientations, we use SIFT and color distribution features to find the most similar orientation for these pictures in the second class.

For the third class, the pictures do not have faces inside but also are not similar to the first class ones. However, they are similar with each others, e.g., takes many shots for a famous building. For this case, we can find the relative orientation by the features mentioned before. Thus, we can set a picture for a correct orientation by users, and all pictures in the same group are labeled automatically. The last class is the hardest part to be handled. We use SVM to test pictures orientation, and it is trained by color and edge distribution of the images [Wang 2001]. The result accuracy has big variance from 55% to 85%. Depends on the scenes, the outdoor scenes are much better than the indoor ones, because the former usually has the sky, ground, or tree structures, which are strong features to be detected.

6 Conclusion and Future Work

In our "Smart Album", the photo filtering work can save lots time from checking all pictures when managing photos, although there are still some challenges. One is that it is hard to make a right judgment for artificial effects. A scene may be labeled as *blur* if it has very small depth of fields, though the focused object is relative a small area. However, this system is not claimed to fully automatic filtering the pictures; we also provide an interface for users. For the pictures which are marked and labeled, the users can easily choose to manage, or remove them. The future work is to build a complete album handling system. It will be implemented de-blur for the *blur* pictures, relighting for abnormal exposure pictures, and face recognition for filtering the photos for a specified person.

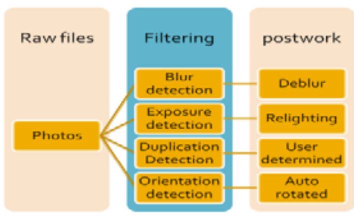

Fig 2. System overview for our "Smart Album". In this poster, we only focus on the filtering part.

Reference

Yongmei Wanga and Hongjiang Zhang 2001. Content-Based Image Orientation Detection with Support Vector Machines. *IEEE Workshop on Content-Based Access of Image and Video Libraries (CBAIVL'01)*, 17-23