Background separation approach in single image based on CLBP and color cues

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Abstract

Object extraction problem is one of the most important topics in the research area of computer vision, this type of technique can be widely used in practical, such as image processing, robot vision, automatically traffic guide and so on. In this paper, we propose a different way to estimate the background and foreground without any previous training procedure, this approach can be used for automatic object extraction in the future. A simple experiment result shows that our approach has a good potential for the further more practical application.

1. Introduction

Object extraction technique is widely used nowadays, such as robot vision, image processing and so on [1] [2]. To achieve the good quality of separation effort for foreground part and background part, many different techniques are used. Compare with traditional approach for prior knowledge estimation for object extraction, such as texture analysis or edge detection [3], we propose a new estimation method based on CLBP feature and color cues. The information of boundary regions are highly used to do the estimation of the global background region for the whole image. This algorithm is developed based on several assumptions of from theory of saliency distribution theory:

a. *The regions of object that human notice in an image always has a closed boundary*
b. *The regions of object always locate near the center of the images.*
c. *The boundary part should be assigned lower value of saliency values.*

Based on the theory above, we add a new assum ption that boundary regions carry most of the predi ct information of the background, which is the start ing point of our approach.

The details of the algorithms will be described in the following sections.

2. Algorithm scheme

a. SLIC segmentation

The original image is firstly divided into small regions with SLIC (Simple Linear Iterative Clustering) superpixel method [4]. Each small region achieved from the method is treated as a big size pixel in the future processing. SLIC can greatly reduce the computation complexity.

b. Color cue estimation

In this step, the regions achieved by SLIC method will be classified into two types: Boundary Regions and Center Regions. The regions cover the boundary of the original image will be selected out. Then we did a statistic processing for the color information of the boundary region, half of the most frequently used colors will be selected out as color cues of background.

c. CLBP calculation

The image will cut as follow:

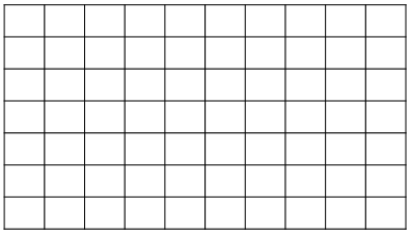


Fig. 1 Image segmentation for CLBP

For each pixel we calculate its CLBP (complete Local Binary Pattern) value, and for each pair of blocks, we calculate their distance with the histogram difference. Then randomly choose a block and set its CLBP value as 0, then according the distance of each pair, we get a CLBP value for each region. Then normalize the matrix to get a texture information matrix.

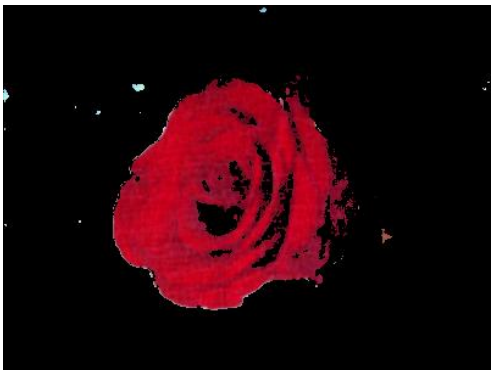
d. Saliency value assignment

After get the color cues and CLBP values for texture information, we then assign the saliency value for each pixel. The pixels in the boundary part are adopted as the standard region of background, for each pixel in the image, we calculate its average color distance with boundary region, then multiply the average CLBP value. Then for this value of pixels, if it is large then a predefined threshold T, the related pixel is removed. After the whole processing, the remaining part is the foreground estimator.

3. Simple experiment results

Some simple experiment results are show in as follows:

Original image A



Estimation result A

Original image B

Estimation result B

Fig. 2 Experiment results

4. Conclusion

The experiment results show that our prediction method is efficiency for the images which satisfy our previous assumptions, and in the future, these information of foreground and background of single images can be treated as training data of classification method to enhance the accuracy of the prediction results so as to get a much better separation boundary.

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