Smart Phone Road Signs Recognition Model Using Image Segmentation Algorithm

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Abstract

Image recognition is one of the most important research directions of pattern recognition. Image based road automatic identification technology is widely used in current society, the intelligence has become the trend of the times. This paper studied the image segmentation algorithm theory and its application in road signs recognition system. With the help of image processing technique, respectively, on road signs automatic recognition algorithm of three main parts, namely, image segmentation, character segmentation, image and character recognition, made a systematic study and algorithm. The experimental results show that: the image segmentation algorithm to establish road signs recognition model, can make effective use of smart phone system and application.

Keywords

Image recognition, Segmentation algorithm,Road signs,Smart phone

I. Introduction

With the development of computer and artificial intelligence technology arisen, people began to explore the complex processing mechanism and that the use of computer simulation and the expansion of human intelligence in pattern recognition. With the social progress and the development of science and technology, used smart phone number increasing, smart phone within an application program is updated, and the maximum to meet the needs of people. Smart phone can be seen as miniature computer, if the use of image segmentation algorithm to make the road signs recognition model, applied to the intelligent mobile phone application, will bring people benefits.

Image segmentation in digital image processing is a key technology, it makes the subsequent image analysis, identification and other advanced stages of processing the data to be processed is greatly reduced, while retaining the structural characteristics of the image information. As a result of segmentation errors will spread to high-level processing stage, the exact extent of segmentation is crucial, over the years has been the researchers pay attention, is considered to be the bottleneck of the computer vision. Image processing image segmentation is the main problem in the field of computer vision, is the main problem in low level vision, it is also a classical difficult problem. Due to the importance of the problem and difficulty, since seventy time the image segmentation problem has attracted many researchers pay great efforts, but so far has not the existence of a general method, nor the presence of a judgment whether the success of the objective standard of segmentation.

This paper adopts the region segmentation algorithm, image segmentation, character segmentation, image and character recognition, based on the road signs image ,and established model, realization of smart phone application program generation.

II. Region segmentation algorithm

There also divides a lot of kinds of region segmentation algorithms, this method is employed, first from the whole image by splitting each region began continuously. Often in practice to the image is divided into arbitrary size constant overlap region, and then merge or split in order to

meet the requirements in these regions segmentation.

In this method, the most common method of four fork tree decomposition method. Let R represents the entire square image region is shown in the graph, P represents a logical predicate. Start from the top, the R continuous split into smaller and smaller 1/4 square area Ri, and always make P (Ri) =TRUE, in other words, if P (Ri) =FALSE, then the image is divided into 4 parts. And so on, until the Ri for a single pixel.

If only allows the use of split, finally there may be two adjacent regions having the same character but not synthetic one case. In order to solve this problem, in every division to allow subsequent to split or merge. Here to merge merge only those adjacent and merger of new areas to meet the logical predicate P area. Summarize the basic split and merge algorithm steps are as follows:
①For any area, if P (Ri) =FALSE will be split into 4 equal parts do not overlap;
②On two adjacent areas Ri and Rj a gate may also be of different sizes, which are not in the same layer, if condition P (Ri ∪ Rj)=TRUE,thencombiningthem;
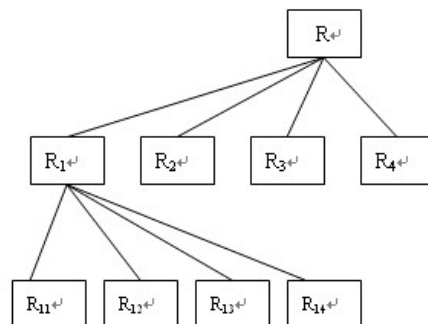③If further splitting or merging all impossible, then the end.

The images of four fork tree decomposition process and results are as follows:

```
subplot(1,2,1);
imshow(I);
title(' Original image ');
S=qtdecomp(I,0.2);
N=full(S);
subplot(1,2,2);
imshow(N);
title(' Decomposition of image display');
[vals,r,c]=qtgetblk(I,N,2);
[vals1,r,c]=qtgetblk(I,N,4);
[vals2,r,c]=qtgetblk(I,N,8);
[vals3,r,c]=qtgetblk(I,N,16);
[vals4,r,c]=qtgetblk(I,N,32);
[vals5,r,c]=qtgetblk(I,N,1);
size(vals);size(vals1);size(vals2);
size(vals3);size(vals4);size(vals5);
```
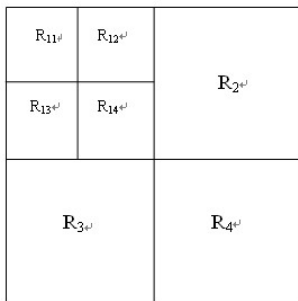

(a) Four forks few division　　(b) Four forks the tree structure

Figure 2-1 Images of the four forks the tree decomposition diagram

III. Local maximum variance partitioning method

This paper takes the local maximum variance partitioning method, process is as follows:
(1) n× n segmentation of the image into m ×m sub image.
(2) To determine the image is Shuangfeng (containing the target and background) or with a single peak (containing only the target or background).
a) With Shuangfeng on the sub image using the maximum variance method segmentation segmentation. The maximum variance segmentation algorithm the basic idea is: a given image with N

image gray value, average intensity η . For 1 < K < N, K 1~ N were divided into 2 groups, group 1 mean gray level η_1, produces a probability of ω_1, group of 2 mean gray level η_2, ω_2 generation probability. The group asked the variance of $\sigma^2(k) = \varpi_1(\eta_1 - \mu)^2 + \varpi_2(\eta_2 - \mu)^2$ is the maximum when the corresponding

K value is the threshold segmentation. ω_1 of them are gray level for 1 ~ K pixel number proportion, $\omega_2 = 1 - \omega_1$.

b) With single peak sub images using neighborhood subset of image threshold interpolation to obtain segmentation threshold. As shown in Figure 3-1, $T_0 = \frac{1}{4}(T_2 + T_4 + T_6 + T_8)$ (T_0unimodalnatureimagethreshold)

T_1	T_2	T_3
T_8	T_0	T_4
T_7	T_6	T_5

Figure 3-1

(3) Obtain the threshold matrix {Threshold (i , j) ; 1 $\leq$ i , j $\leq$ m},inordertomaintaintheimagethresholdsmoothing,usingLagrangelinearinterpolationmethodonthresholdmatrixinterpolationprocessing,accesstothepixelthresholdmatrix {Threshold (i , j) ;1 $\leq$ i,j $\leq$ n}.

(4) Obtained by using the threshold matrix to the original image two values

$$B(i,j) = \begin{cases} 1, if\ f(i,j) > Threshold(i,j) \\ 0, \qquad other \end{cases}$$

IV. Model structure

4.1 Sample selection

In this paper, using a standard signpost as test samples, choose several pieces of color signpost, as shown in figure 3-1. For ease of identification, the true color image samples for digital processing, will be converted to grayscale image.

Figure 4-1 Samples of the gray image

4.2 Recognition process

In order to realize the road signs recognition, often requires the following steps: image preprocessing, graphic and character segmentation, graph and character recognition (Figure 3-2).

4.3 Recognition experiment

Select a signpost sample images as an example,

the following is the value of the diagram (Figure 4-3).

Figure 4-2 Road automatic identification system

4.3 Recognition experiment

Select a signpost sample images as an example, the following is the value of the diagram (Figure 4-3).
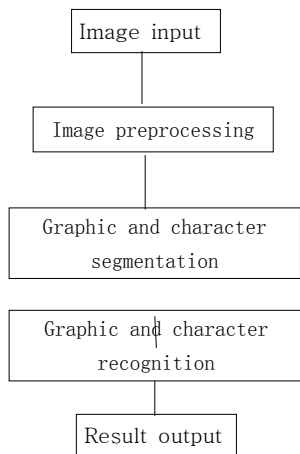
Figure 4-2 Road automatic identification system

Figure 4-3 The value of the two sample pictures

The segmented image samples into four forks the tree decomposition procedure, can get the recognition results.

Thus it can be seen, the images of the two values can be more accurate recognition image. The result of image recognition, through the text displayed in smart phone screen.

V. Conclusion

(1)The use of regional segmentation algorithm, the picture is divided into four binary tree after the decomposition procedure, can be simply and effectively identifying road signs image.

(2)Smart phone can automatically adjust the angle, so we do not consider the recognition process by adjusting the angle, greatly simplify the process of identification.

(3)Such a segmentation algorithm, although is simple and easy to operate, but there are still problems, such as weather, noise, dirt etc. factors, the theory still needs further discussion.
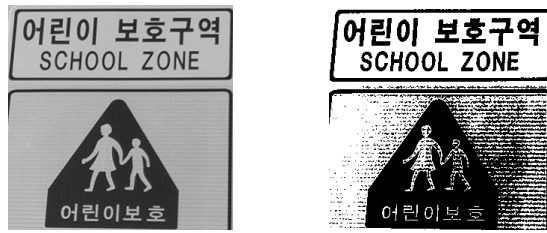
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