AgSPPR at ImageCLEF 2013 plant identification task

Lu Zhang[1], Cheng Cai[2]

[1,2]University of Northwest Agriculture & Forestry,
The college of Information Engineering, Xinong road, Yang Ling, China
t4zzzz@gmail.com,cheney.chengcai@gmail.com

Abstract. The paper describes our methods of three runs for the participation to the plant identification task of ImageCLEF2013.We use three kind of image features to do identification, which are spatial principal component analysis of census transform histograms (SPACT) ,a descriptor based on the global shape feature and scale invariant feature transform (SIFT). And the classifier we employed is the Support Vector Machine(SVM). The result show that the SIFT method perform best.

Keywords: census transform histograms, scale invariant feature transform, Support Vector Machine

1   Introduce

In the plant identification task of ImageClef 2013,our team submitted three runs.All of these runs are fully automatic.But because of the limited capacity and the limited time,we only dealt with the kind of SheetAsBackground.

2   Methods

In our three runs, we used three kinds of features to do identification
.

2.1 run1

In this run,we extracted three descriptors which are based on the global shape features of the leaf image.The features are about the area of leaf and the length of major axis and length of minor axis[1]. As illustrated in figure 1, the three descriptors are:

(1) $\sqrt{A}$

(2) $h1/h2$

(3) $A/(h1+h2) \times (v1+v2)$
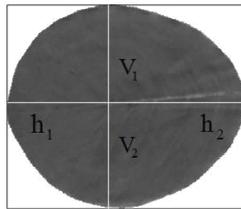
Fig. 1. External rectangle of a leaf

The classifier is a multi-class classification SVM with a radial basis function kernel. And the SVM tool we employed is libsvm for matlab[2].

2.2 run2

In this run,we employed the Scale Invariant Feature Transform (SIFT) algorithm to find key points of every photo. And the algorithm is developed by David Lowe[3]. Then we matched one test photo's key points with every train photo's key points.The rank of every test photo's predeterminate classids is based on the numbles of matched points between this test photo and a train photo.

2.3 run3

In this run,the descriptors are based on CENTRIST (CENsus Transform hISTogram). It is called Spatial Principal Component Analysis of Census Transform Histograms(SPACT)[4][5].

In this method, firstly we should transform the gray image to the census transform histogram(CT). As illustrated in figure 2, for every pixel of the gray image,comparing

the gray level of the pixels in its 8 neighbourhoods with this pixel's gray level. If one neighborhood pixel's gray level is greater than the middle pixel's, then set this neighbour pixel to bit 1. Else set it to bit 0.
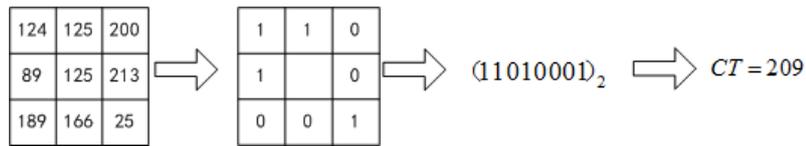
Fig. 2. Calculate the CT value of one pixel
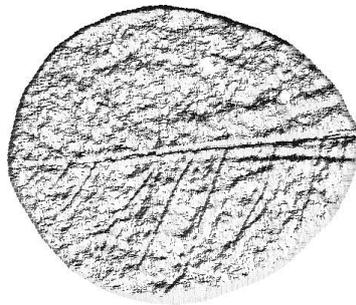
Fig. 3. The CT image transformed from gray image

After calculate all pixels of the gray image,in order to get the more detailedness information of the image,the CT image is divided to small pieces and resized as illustrated in figure 4.
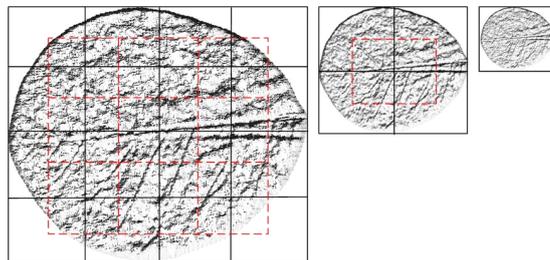
Fig. 4. Resize and divide the CT image

Then we get 31 small pieces. For every small pieces,we census the numbles of the value between 0 and 255. So we get 31*256 descriptors for one image. Because of so many numbles of descriptors, we use PCA to reduce the dimension. As illustrated in figure 5, the contribution of the top 50 components is more than 99%, so we get the top 20 components.
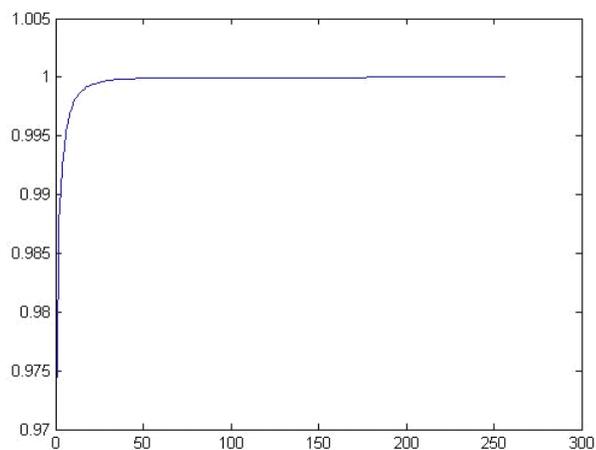
Fig. 5.   Accumulative contribution of each

And The classifier is a multi-class classification SVM with a radial basis function kernel.

3 conclusion

We think that if combine one descriptor with others, maybe we can get better result.

In the kind of SheetAsBackgroud,our best rank is run2 which place is 18th.Though our performance is not nice,the participation of this task add our experience about this filed.

Reference

1.Granitto, P. M., Navone, H. D., Verdes, P. F., & Ceccatto, H. A. 2002. Weed seeds identification by machine vision. Computers and Electronics in Agriculture, 33(2), 91-103.

2.LIBSVM--Chih-Chung Chang and Chih-Jen Lin:

`http://www.csie.ntu.edu.tw/~cjlin/libsvm/`

3.Lowe, D. G. 2004. Distinctive image features from scale-invariant keypoints. International journal of computer vision, 60(2), 91-110.

4.Wu, J., & Rehg, J. M. 2011. CENTRIST: A visual descriptor for scene categorization. Pattern Analysis and Machine Intelligence, IEEE Transactions on, 33(8), 1489-1501.

5.Wu, J., & Rehg, J. M. 2008. Where am I: Place instance and category recognition using spatial PACT. In Computer Vision and Pattern Recognition, CVPR 2008. IEEE Conference (pp. 1-8). IEEE.