SUPPORT OF ACQUISITION OF RECOGNITION OF MUSHROOM IMAGES

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Abstract: Proper recognition of mushrooms is one of the key safety issues in mushroom picking activities widely spread in Czech Republic, Slovak Republic, and other countries in Central Europe. The contribution proposes a novel approach to support at recognition of the mushrooms through mobile communication devices, such as cellphones. The user - mushroom picker - is supposed to take a picture of a mushroom in question through the mobile device which then attempts to recognize the mushroom or to suggest a set of possible similar mushrooms in order to simplify their recognition by the users. The recognition process itself uses shape parametrization as well as texture and color properties of the mushroom. The mushroom picking prototype application runs on Android devices that are widely spread and inexpensive enough to enable wide exploitation by users. The contribution contains description of the basic principles and presents the content of the future Bc. thesis of the author.

Keywords: Object Detection, Object Recognition, Mushroom Picking, Mobile Device, Android

1 INTRODUCTION

Mushrooming is a very popular activity in Central European countries. Although the mushrooming has a long history, even the experienced mushroom pickers can recognize only between 50 and 300 species of mushrooms. They search other mushrooms in atlases, which are often available only in pocket versions. In order to minimize the weight, this kind of atlases contains only the most common mushrooms which are often known to the mushroom pickers. One way or another, the amount of mushrooms that grow here quite commonly is more than 1500.

The target platform is wide spread and powerful enough mobile *Android* device. The mobility of these devices is for operation such as image recognition - in this case mushroom recognition - of a great benefit. To use all advantages of such device, the recognition does not depend on any Internet or other connection which could be hardly reachable deep in the forest. This contribution builds on the conclusions of the *Damien Matti's* [2] project.

The main purpose of the presented work is to design and implement an application running on a mobile Android device. This application sets the goal to take a mushroom image and let the device to recognize it using its visual signs. The results are presented as a list of the most probable mushrooms.

2 RECOGNITION

This section summarizes the proposed methods and ways how to take an image, what features and how to extract them, and the way how to use them to be an input of the *Support Vector Machine (SVM)* [3] classifier.

The basic outline of the recognition is following. The user takes a photo of a mushroom. The appli-

cation asks him to mark a background and a foreground. The segmentation is done and masks are computed. All the features are then extracted, normalized and concatenated into one single multidimensional vector to be an input of the SVM classifier. The recognition is done and several top rated results are presented to the user.

2.1 Sensing, Preprocessing and Segmentation

Many of the features typical for mobile Android devices are used for the part of the data aquisition process - sensing and preprocessing. The motion sensor is used to restrict the sensing angle. This is done because the recognition is partially based on the shape parameters and the wrong angle could possibly skew the curves of the edges or totally hide for example the bottom of the cap. To help to center the sensed mushroom, there is also visual help shown on the device preview surface. Another used Android feature is the LED light. This is supposed to be constantly on to eliminate shadows and unify the brightness.

The extraction of the mushroom from its background as well as the cap and the stem split uses an implementation of GraphCut [5, 6, 7, 8] method. The user is then asked to mark the mushroom and a background. The segmentation based on the marked points is done and the mask of mushroom and background is done. According to color histograms the mask of the mushroom is also split to the cap and the stem, but this time automatically.

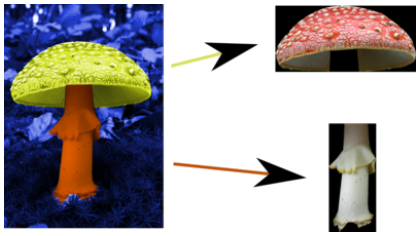

Figure 1: Illustration of process of extracting a mushroom from its background

2.2 Feature extraction

From the previous operation there is a mask of the stem, the cap and the background. The left most and the right most points of the cap are found. Then the width of the mask of the cap is divided into fifths and the intersects with the top, the middle and the bottom edges are chosen (Figure 2). An analogical operation is done with a stem of a mushroom (Figure 3).

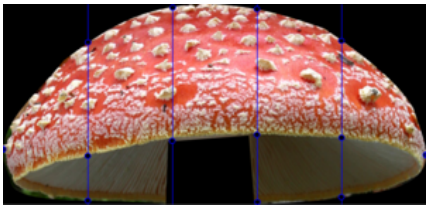

Figure 2: Illustration of cap segmentation for parameters extraction

Figure 3: Illustration of stem segmentation for parameters extraction

These intersects are normalized by a straight line determined by the left most and the right most points of the cap, or the top and the bottom points of the stem.

Another feature gathered from the image is color histogram of a stem and a cap. The color depth is reduced to the 3-3-2-bit palette. The advantages of this reduction are much bigger than disadvantages,

namely loss of information, so all histograms or color operations are computed in this color palette.

The last but not least important feature is the presence of gills or pores on the bottom side of a cap. Only two classes exist, gills and pores, so it can be possible to train the SVM classifier on the whole dataset and let it to distinguish between them.

3 CONCLUSION

In this contribution, the approach to support of mushroom machine recognition using mobile Android device was proposed. The previous contributions and projects of similar topic have been used as well as the mycological knowledge in part of choosing proper features.

It is planned to create a beta version of the application. The user will be asked to send anonymous statistical data such as sensed images and classification results. The evaluation is going to reveal, wheter it will be better to train the classifier to distinguish among individual mushroom species or only among their families, or what features are really valuable and properly chosen.

There are some unmistakable species such as Amanita Muscaria or Boletea family. The expected success of these species is almost 100%. What is really important, is to recognize correctly the lesser frequently occurring mushrooms. The expected success is to have the correct mushroom among the top ten returned mushrooms. Otherwise, it could be quite dangerous, especially in the case when the sensed mushroom is poisonous and in the returned list are only edible mushrooms.

The way how to improve results - and possibly quite radical - is to choose other features or choose more of them. However, this could have a significant influence of power and time requirements of such a recognition. On the other hand, the computing power of such devices is still increasing.

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