Mathematical and Computer Modelling 54 (2011) 1030–1036

Contents lists available at ScienceDirect

Mathematical and Computer Modelling

journal homepage: www.elsevier.com/locate/mcm

Textural features in flower classification

D.S. Guru [a], Y.H. Sharath Kumar [a], S. Manjunath [a,b,*]

[a] Department of Studies in Computer Science, University of Mysore, Manasagangotri, Mysore 570 006, India
[b] International School of Information Management, University of Mysore, Manasagangotri, Mysore 570 006, India

ARTICLE INFO

Article history:
Received 14 August 2010
Accepted 4 November 2010

Keywords:
Color texture moments
Gray level co-occurrence matrix
Gabor responses
Flower classification
Probabilistic neural network

ABSTRACT

In this work, we investigate the effect of texture features for the classification of flower images. A flower image is segmented by eliminating the background using a threshold-based method. The texture features, namely the color texture moments, gray-level co-occurrence matrix, and Gabor responses, are extracted, and combinations of these three are considered in the classification of flowers. In this work, a probabilistic neural network is used as a classifier. To corroborate the efficacy of the proposed method, an experiment was conducted on our own data set of 35 classes of flowers, each with 50 samples. The data set has different flower species with similar appearance (small inter-class variations) across different classes and varying appearance (large intra-class variations) within a class. Also, the images of flowers are of different pose, with cluttered background under various lighting conditions and climatic conditions. The experiment was conducted for various sizes of the datasets, to study the effect of classification accuracy, and the results show that the combination of multiple features vastly improves the performance, from 35% for the best single feature to 79% for the combination of all features. A qualitative comparative analysis of the proposed method with other well-known existing state of the art flower classification methods is also given in this paper to highlight the superiority of the proposed method.

1. Introduction

Developing a system for classification of flowers is a difficult task because of considerable similarities among different classes and also due to large intra-class variations. In a real environment, images of flowers are often taken in natural outdoor scenes, where the lighting condition varies with the weather and time. In addition, flowers are often more or less transparent, and specula highlights can make the flower appear light or even white, causing illumination problems. Also, there is lot more variation in viewpoint, occlusions, and scale of flower images. All these problems lead to a confusion across classes and make the task of flower classification more challenging. In addition, the background also makes the problem difficult, as a flower has to be segmented automatically.

Applications of classification of flowers can be found useful in floriculture, flower searching for patent analysis, etc. Floriculture has become one of the important commercial trades in agriculture owing to a steady increase in the demand for flowers. The floriculture industry comprises flower trade, nursery and potted plants, seed and bulb production, micro propagation, and extraction of essential oil from flowers. In such cases, automation of flower classification is essential. Further, flower recognition is used for searching patent flower images to know whether the flower image for which a patent has been requested is already present in the patent image database or not [1]. Since these activities are done manually and are very labor intensive, automation of the classification of flower images is a necessary task.

* Corresponding author at: Department of Studies in Computer Science, University of Mysore, Manasagangotri, Mysore 570 006, India. Tel.: +91 9035228978.
E-mail addresses: dsg@compsci.uni-mysore.ac.in (D.S. Guru), sharath@yahoo.co.in (Y.H. Sharath Kumar), manju_uom@yahoo.co.in (S. Manjunath).

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doi:10.1016/j.mcm.2010.11.032