CLASSIFICATION MODELING FOR MALAYSIAN BLOOMING FLOWER IMAGES USING NEURAL NETWORKS

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Abstrak

Pemprosesan imej merupakan bidang penyelidikan dalam bidang sains komputer yang berkembang pesat sejak ia diperkenalkan dan sehingga kini ia masih merupakan satu masalah yang mencabar dalam bidang multimedia dan perkomputeran. Bagi imej bunga-bungaan, masalah utama adalah disebabkan persamaan yang ketara di antara setiap bunga dengan bunga lain dari segi warna dan tekstur. Rupa bentuk imej seperti pencahayaan yang berbeza, kesan bayangan terhadap permukaan objek, saiz, bentuk, putaran dan kedudukan, latar belakang imej, keadaan bunga yang mengembang atau mula mengembang merupakan masalah yang dihadapi dalam pemprosesan imej. Oleh kerana pengecaman nama bunga masih lagi kompleks, kajian ini dijalankan bertujuan untuk membangunkan model pengkelasan bunga bungaan Malaysia yang mengembang dengan menggunakan Rangkaian Neural berasaskan *backpropagation*. Imej bunga diekstrak melalui *Region of Interest* (ROI) di mana nilai warna dan tekstur sahaja yang akan diberi penekanan dalam kajian ini. Sejumlah 960 imej telah diekstrak daripada 16 jenis bunga. Setiap jenis bunga diwakili oleh 60 sampel ROI, manakala setiap ROI diwakili oleh 3 sifat warna (*Hue, Saturation* dan *Value*) dan 4 sifat tekstur (*Contrast, Correlation, Energy* dan *Homogeneity*). Menerusi fasa latihan dan pengujian, analisis dilaksanakan untuk meninjau prestasi rangkaian neural berdasarkan *difficult to learn pattern* yang digandakan (dirujuk sebagai DOUBLE) kerana ia mungkin dapat memberi gambaran mengapa imej bunga sukar untuk dikelaskan. Dapatan kajian menunjukkan bahawa Rangkaian Neural berdasarkan DOUBLE memperoleh ketepatan sebanyak 96.3% dan data asal sebanyak 68.3% manakala ketepatan Regresi Logistik dengan data asal ialah 60.5%. Hasil pengkelasan pohon pemutusan menunjukkan j*Chi-Squared Automatic Interaction Detection* (CHAID) dan *Extended Chi-Squared Automatic Interaction Detection* (EX-CHAID) memperoleh prestasi yang paling tinggi sehingga mencecah 42% dengan DOUBLE. Dapatan kajian menunjukkan bahawa Rangkaian Neural dengan set data DOUBLE memperoleh prestasi tertinggi berbanding Regresi Logistik dan Pohon Pemutusan. Oleh itu Rangkaian Neural mempunyai potensi dalam pembangunan model bunga-bungaan Malaysia. Kajian pada masa akan datang boleh menumpukan kepada penambahan saiz data kajian dan ROI yang mungkin dapat meningkatkan prestasi ketepatan. Model klasifikasi bunga yang dibangunkan dalam kajian ini boleh dijadikan sebahagian daripada sistem pengecaman bunga Malaysia pada masa akan datang di mana warna dan tekstur diperlukan dalam proses pengecaman bunga.

Kata kunci: Klasifikasi imej, Rangkaian neural, Perseptron berbilang lapisan, Pohon pemutusan, Regresi logistik.

Abstract

Image processing is a rapidly growing research area of computer science and remains as a challenging problem within the computer vision fields. For the classification of flower images, the problem is mainly due to the huge similarities in terms of colour and texture. The appearance of the image itself such as variation of lights due to different lighting condition, shadow effect on the object's surface, size, shape, rotation and position, background clutter, states of blooming or budding may affect the utilized classification techniques. This study aims to develop a classification model for Malaysian blooming flowers using neural network with the back propagation algorithms. The flower image is extracted through Region of Interest (ROI) in which texture and colour are emphasized in this study. In this research, a total of 960 images were extracted from 16 types of flowers. Each ROI was represented by three colour attributes (Hue, Saturation, and Value) and four textures attribute (Contrast, Correlation, Energy and Homogeneity). In training and testing phases, experiments were carried out to observe the classification performance of Neural Networks with duplication of difficult pattern to learn (referred to as DOUBLE) as this could possibly explain as to why some flower images were difficult to learn by classifiers. Results show that the overall performance of Neural Network with DOUBLE is 96.3% while actual data set is 68.3%, and the accuracy obtained from Logistic Regression with actual data set is 60.5%. The Decision Tree classification results indicate that the highest performance obtained by Chi-Squared Automatic Interaction Detection(CHAID) and Exhaustive CHAID (EX-CHAID) is merely 42% with DOUBLE. The findings from this study indicate that Neural Network with DOUBLE data set produces highest performance compared to Logistic Regression and Decision Tree. Therefore, NN has been potential in building Malaysian blooming flower model. Future studies can be focused on increasing the sample size and ROI thus may lead to a higher percentage of accuracy. Nevertheless, the developed flower model can be used as part of the Malaysian Blooming Flower recognition system in the future where the colours and texture are needed in the flower identification process.

Keywords: Image classification, Neural networks, Multilayer perceptron, Decision tree, Logistic regression.

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CHAPTER ONE
INTRODUCTION

This chapter presents the background of the project that focuses on Malaysian Blooming Flowers classification. The problem statements and objectives of the study are also mentioned in this chapter. In addition, the research questions are formulated, the research scope as well as the significant of the research also provided in this chapter.

1.1 Overview

Classification is an active research area in data mining which most frequently involve the decision making (Zhang, 2000).Classification aimstopredict categorical class labels for new samples (Dehkordi&Shenassa, 2006). It involves the process of grouping objects (information) accordingly into their belonging classes or groups based on their characteristic (Qi & Davidson, 2009).

In classification, there are two main schemes that are commonly used namely *Supervised* and *Unsupervised* classification. *Supervised* classification is the process of using samples of known identity or training data to classify pixels of unknown identity (Riviera & Manian, 2008). The training data are used to train the classifier which is tested with testing samples to evaluate the accuracy of the classifier which in turn is testing using test samples to evaluate the accuracy of the classifier. Some of the most commonly used supervised classification methods are Maximum Likelihood, Minimum Distance, Mahalanobis Distance and Neural Networks

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