

سامية محمد مصطفى



شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم



سامية محمد مصطفى



شبكة المعلومات الجامعية



شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



سامية محمد مصطفى



شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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بالرسالة صفحات لم ترد بالأصل



Ain Shams University
Faculty of Computer and Information Sciences
Department of Scientific Computing

**COLORED PATTERN IMAGE CLASSIFICATION
USING NEURAL NETWORKS**

Thesis submitted to the partial
fulfillment of the Degree of Master of Science
In Computer and information Sciences

By

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2001

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A decorative rectangular border composed of repeating floral motifs, specifically stylized roses or carnations, arranged in a grid-like pattern around the central text.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

"وَقُلْ رَبِّیْ زِدْنِیْ عِلْمًا"

صَدَقَ اللَّهُ الْعَظِيمُ



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ABSTRACT

Face Recognition from images is a sub-area of the general object recognition problem. Artificial Neural Networks (ANN) is an automatically nonstatistical approach. ANN is studied and implemented to solve face recognition problem. The objective of the present work is to use the modified linear data reduction network for image coding (feature extraction) and a hybrid neural network system for recognition. Feature extraction methods can be classified into linear and non-linear data reduction. Principal Component analysis (PCA) is considered as modified linear neural network based on Karhunen-Loeve projection. Also we introduce Kohonen Self-Organizing Feature Map (SOFM) neural network as a non-linear data reduction method. The performance of hybrid neural network system was investigated using both gray-scale and color information of the input face images.

The PCA network represents the faces as features or eigenvectors. This network reconstructs the faces as a weighted

sum of eigenvectors extracted from the covariance matrix of a set of face images. The images can be either perfectly represented using the complete eigenvectors, or estimated by using the eigenvectors with the largest eigenvalues. Our objective was to examine all ranges of eigenvectors, and to select the suitable number of eigenvectors necessary to reconstruct a large database of 400 face images with little deterioration in quality.

A hybrid neural network system for automatic face recognition is composed of an unsupervised neural network to feature extraction (Sanger PCA network or Kohonen SOFM), and multi-layer perceptron (MLP) network with a back-propagation algorithm for the recognition task. The implementation of the hybrid building system will be carried out on front face images with variations in facial expression and facial details. Recognition performance depends on variation of the number of features extracted and the number of images per person used in the training stage.

The performance of hybrid neural network system using Sanger PCA as network to feature extraction show correct recognition rates around 93.73%. This result is obtained on standard gray-scale database for 40 persons under take (9 images per person in the training stage). A two-dimensional Kohonen SOFM was investigated for all ranges of the dimensionality of the output layer in order to improve performance. The shape of the neighborhood of the output layer was tested for both squared and diamond shape. The performance of the hybrid SOFM/MLP network can provide successful recognition rate of 93.5%. This result is obtained on standard gray-scale database of 40 persons, under take 5 images per person in the training stage, compared to the rate obtained with PCA/MLP (82.2%).

The recognition performance is analyzed using both gray-scale and color information to adapt a face recognition system to deal with the color information for images. The three-color components are processed separately, instead of processing only one luminance component.

The performance of the hybrid neural network system using Sanger PCA as network to feature extraction is evaluated on the YUV, RGB, and HSV color space. The recognition results on color faces show that, the color information can help in face recognition process. The choice of color space is important, and some color components are more important than others. The luminance Y is the most useful information with recognition rate 94.6% for present sample. The recognition rate of the blue component B seems higher with recognition rate 100% for present sample. Also, the results show that no improvement of the recognition rates was obtained with combinations of the different color components.

The performance of the hybrid neural network system using Kohonen SOFM as network to feature extraction is evaluated on the YUV, RGB, and HSV color space. The luminance Y from YUV, B from RGB, and G from RGB are the most useful information with recognition rate of 100% for present sample.

Key Words: Face Recognition, Artificial Neural Networks, Data reduction, Principal Component analysis, Kohonen Self-Organizing Feature Map, Color spaces.

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