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2D/3D FACE RECOGNITION USING NEURAL NETWORK BASED ON HYBRID TAGUCHI-PARTICLE SWARM OPTIMIZATION

Cheng-Jian Lin[1], Jyun-Guo Wang[2] and Shyi-Ming Chen[2]

[1]Department of Computer Science and Information Engineering
National Chin-Yi University of Technology
Taichung County, 411, Taiwan
cjlin@ncut.edu.tw

[2]Department of Computer Science and Information Engineering
National Taiwan University of Science and Technology
Taipei 106, Taiwan
{ d9715006; smchen }@mail.ntust.edu.tw

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Abstract. *In this paper, we present a neural network classifier with hybrid evolutiuonary algorithm for solving 2D/3D face recognition problems. We first use Gabor wavelets to extract local features at different scales and orientations for gray facial images, then combine the texture with the surface feature vectors based on principal component analysis (PCA) to obtain feature vectors. We propose a neural network classifier based on hybrid Taguchi-particle swarm optimization (HTPSO) algorithm for face recognition. Experimental results demonstrate that the proposed HTPSO learning method has a better recognition rate than those of other approaches.*
Keywords: Face recognition (FR), Taguchi method, Particle swarm optimization (PSO), Principal component analysis (PCA), Multilayer neural networks (MLNN), Gabor wavelet

1. **Introduction.** Biometrics is aimed at capturing and using physiological or behavioral characteristics for purposes of personal identification or individual verification. Mary computer vision-based systems have become more and more important in recent years, such as the surveillance, automatic access control and the human-robot interaction. Face recognition plays a critical role in those applications. The face recognition is a natural intuitively appealing and straightforward biometric method. It has drawn many interest and attention in many applications and areas such as computer vision, image processing, and pattern recognition [1-11]. In practice, face recognition is a very difficult problem due to a substantial variation in light direction, different face poses, and diversified facial expressions. Even though humans can detect and identify that with little or no effort, building an automated system that accomplishes such objectives is very challenging.

In previous research, most face recognition is based on the evaluation of 2D gray image. The 2D gray image includes texture information. Several methods have been proposed to conduct 2D face recognition such as principal component analysis (PCA) [5,9], independent component analysis (ICA) [6], linear discriminate analysis (FLD) [7] and common vector method (CVM) [8] etc. In these approaches [5-9], they utilized the pixel intensity or intensity-derived features and the characteristic classifier has its own representation of basis vectors from a high dimensional face vector space for obtaining features of face images. However, these methods can only analysis 2D gray images, but it is not sufficient for 3D characteristic images with changes with different facial expressions and poses.