Facial Recognition and Identification based on Principal Component Analysis Utilizing a Transform Domain Algorithm with Significantly Reduced Storage Requirements

Advantages
• Increased facial recognition accuracy
• Lower computational complexity and storage

Invention
Methods and system for image classification/recognition based on two-dimensional principal component analysis in the transform domain, thereby reducing computational complexity and storage requirements without sacrificing recognition accuracy.

Background
Principal Component Analysis (PCA) is a widely utilized mathematical technique for computational feature extraction in the areas of pattern recognition and computer vision. Prior PCA computations utilized for face recognition were carried out using the Eigen faces algorithm and/or the most recent two-dimensional principal component analysis (2DPCA) algorithm. The Eigen faces approach enables systems to learn how to recognize new faces in an unsupervised manner. Although the Eigen faces algorithm performs well while utilizing relatively smaller amounts of storage, its recognition performance decreases significantly as the image size, or scale varies. Unlike the Eigen faces approach, the 2DPCA technique processes images in two-dimensions rather than one. 2DPCA has shown higher recognition accuracy with faster computational speeds. However, this technique suffers from inefficiency in storage requirements since it utilizes far more coefficients for its image representation.

UCF engineering professors have designed an algorithm that will improve upon the accuracy, storage and computational properties of facial image classification/recognition. Unlike the most recent technologies, this algorithm employs a two-dimensional discrete cosine transform which reduces the number of multiplications and additions of the image covariance matrix, thus leading to approximately a 90 percent reduction in storage space required without sacrificing the level of recognition accuracy. By utilizing this significant reduction in the number of coefficients and computations required to process and sort each image, the invention has created a fast and accurate method of facial recognition which requires far less storage than traditional methods.

Application
This technology can be used for designing computer systems which carry out facial recognition, signature verification and other pattern recognition functions on low cost platforms (hardware). Manufacturers of said systems can utilize this invention to decrease the size, power consumption and cost of their products, while increasing their accuracy and portability.

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