Summary of the Paper: Face Recognition Using Eigen-Face Implemented on DSP Processor

# Introduction

Facial recognition has become a rapidly growing area in biometrics due to its non-intrusive nature and the potential for diverse applications, including security and crime prevention. The paper discusses the challenges involved in building an automated face recognition system, primarily due to the variations in facial expressions, lighting, and angles. The methods for face recognition are broadly classified into feature-based, appearance-based (holistic), and hybrid methods. This research focuses on the holistic approach using the Eigen-face technique.

# Principal Component Analysis (PCA) and Eigen-Face Approach

PCA is employed in the study as a feature extraction and dimensionality reduction technique, which helps in projecting high-dimensional data into a lower-dimensional feature space. The Eigen-face approach is an appearance-based method that captures variations in face images by analyzing their principal components. By projecting the original face images onto significant eigenvectors, a set of eigenfaces is generated. The face recognition process involves projecting both the training and testing images onto this face space and using Euclidean distance to determine the best match.

# Hardware Implementation

The study aims to implement the face recognition system on a DSP platform to achieve higher efficiency and faster processing times compared to conventional PC-based systems. The TMS320C6713 DSP processor was chosen for its high performance and suitability for real-time face recognition tasks. The paper details the steps involved in training the system, projecting test images, and comparing the results to achieve accurate recognition.

# Experimental Results

The ORL dataset, comprising 400 images of 40 subjects, was used to validate the proposed method. The study conducted several analyses to test the recognition performance under different conditions. By varying the number of PCA coefficients and the number of training images, the study determined that 35 PCA coefficients and increasing the number of training images significantly improve recognition rates, achieving a peak accuracy of 95%. The DSP-based implementation also demonstrated a reduction in processing time to 0.5 seconds, compared to 5 seconds on a PC-based system.

# Conclusion

The paper concludes that the Eigen-face approach, combined with PCA and implemented on a DSP processor, offers a robust solution for real-time face recognition. The method's efficiency in feature extraction and dimension reduction, along with the speed benefits provided by the DSP implementation, makes it a viable option for practical applications. The study's findings highlight the potential of DSP processors in handling computationally intensive tasks like face recognition with high accuracy and reduced processing times.