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# Inquiry: Robust Facial Recognition with Reconfigurable Platforms



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July 8, 2008

# Motivation

- A robust facial recognition system will find a number of applications where other biometric features cannot be used




Biometric	Universality	Uniqueness	Permanence	Collectability	Performance	Acceptability	Circumvention
Face	High	Low	Medium	High	Low	High	Low
Fingerprint	Medium	High	High	Medium	High	Medium	High
Iris	High	High	High	Medium	High	Low	High

- Robustness of facial recognition suffers due to variations such as
  - Illumination conditions
  - Facial expression
  - Temporal changes
- None of the existing facial recognition algorithms are robust for all types of variations in input data !



# Need for reconfigurable hardware

- No subspace-distance metric combination works best for all three variations
- Identification decision from set of algorithms may improve accuracy and reliability
- Goals:
  - Process multiple recognition algorithms concurrently
  - Small footprint, low-power hardware
  - Real-time (or pseudo-) performance

Variation	Best algorithm - distance metric combination	
Temporal changes	 ICA2	COS
Illumination	 PCA	L1
Expression	 LDA	COS

Conclusions from the comparison of PCA, LDA and ICA (by K Delac et al)



# FPGA Implementation

- Concurrently project **test image** into multiple subspaces using PCA, ICA, LDA
- Compare projections of test image to those of training dataset in each subspace using distance metrics such as  $L1$ -norm,  $L2$ -norm
- Find nearest match in each subspace
- Establish identity using a consensus algorithm

