Sparse representation of image & video signals using Independent Component Analysis

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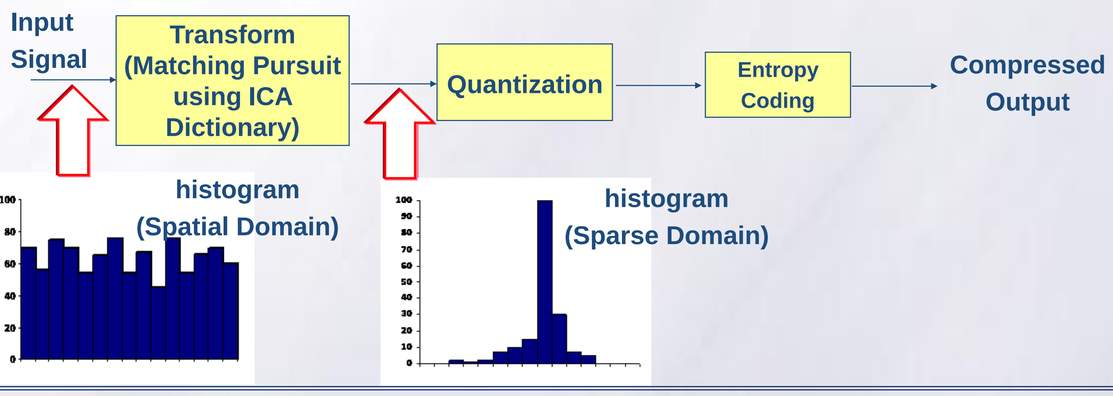
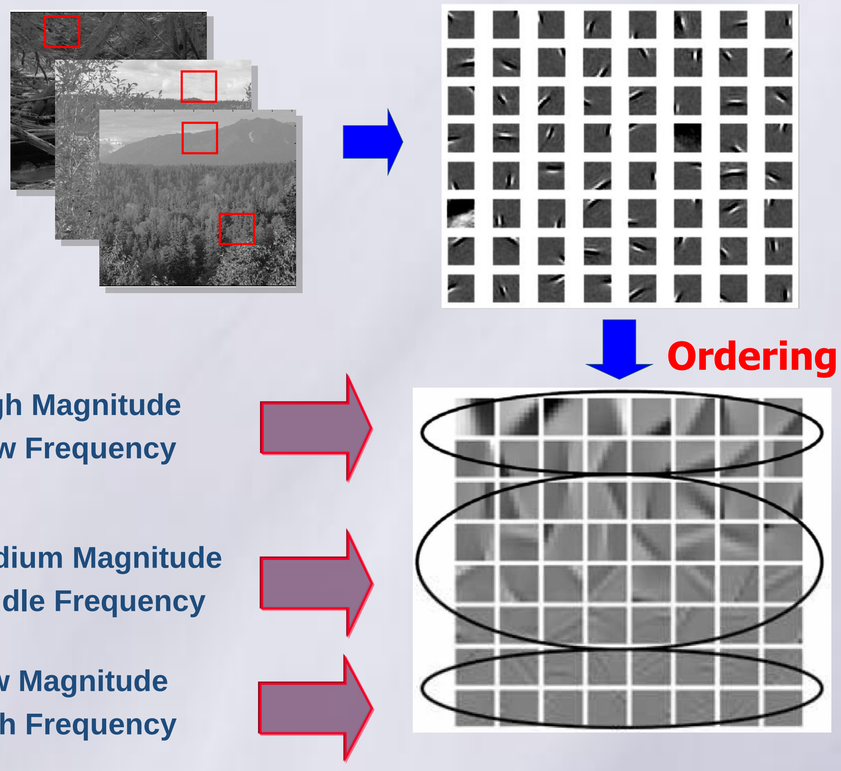
Objective

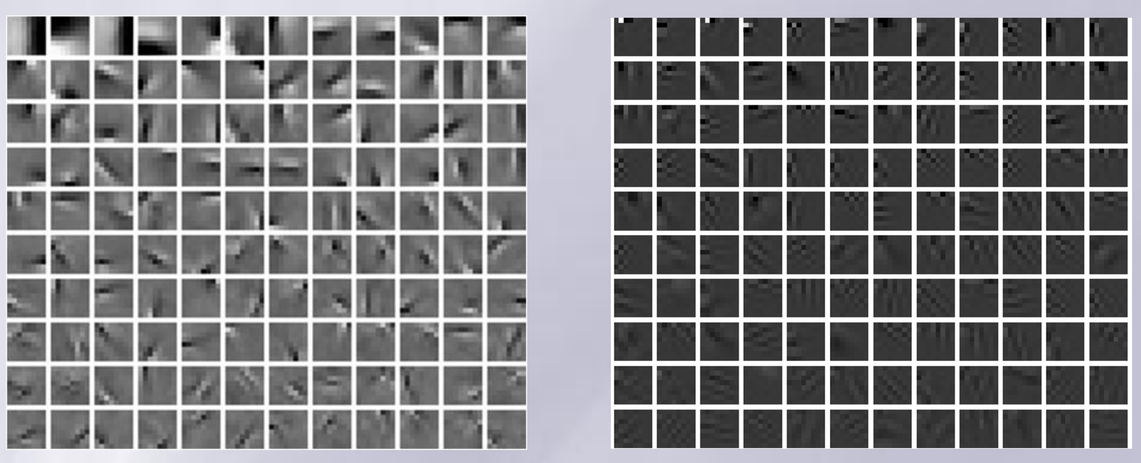
To produce a sparser representation of image and video signals using ICA which can be better compressed by Entropy Coder



Basis Estimation: Random patches were selected from a group of natural images to find a dictionary of atoms using ICA



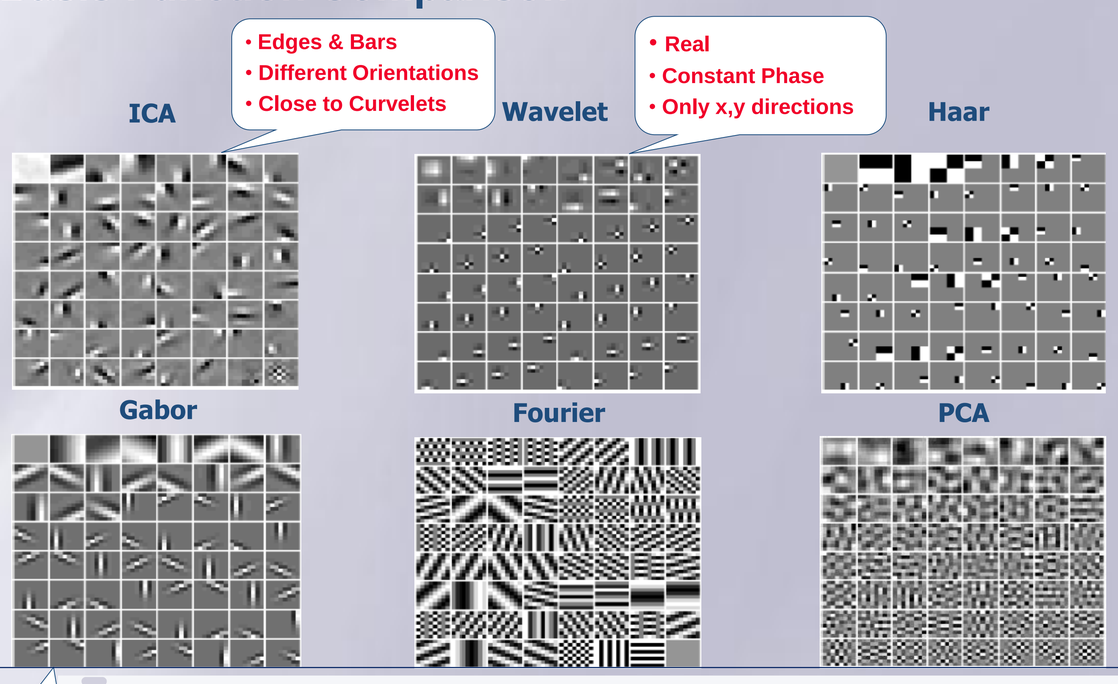
Localization in Spatial and Frequency domain



Spatial Domain

Frequency Domain
(DCT of Basis Functions)

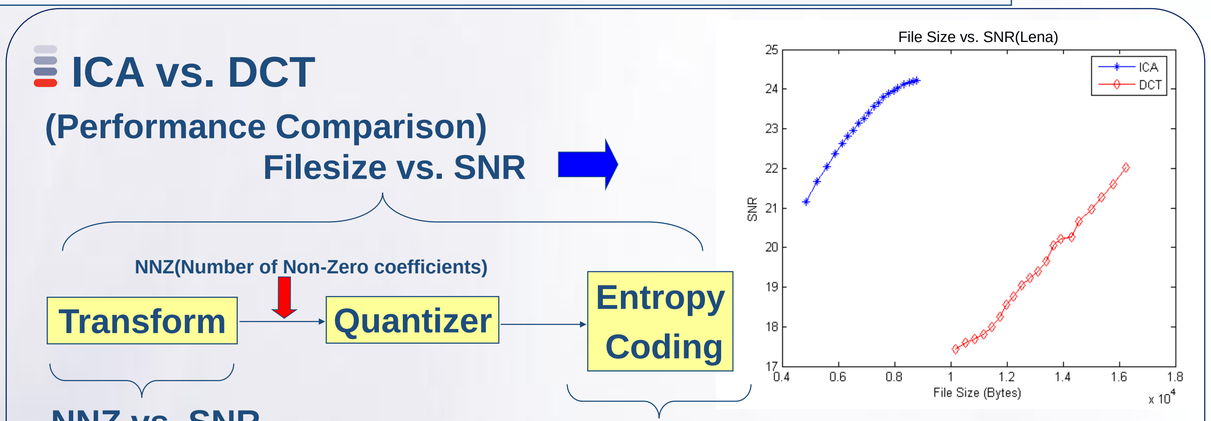
Basis Function Comparison



ICA vs. DCT

(Performance Comparison)

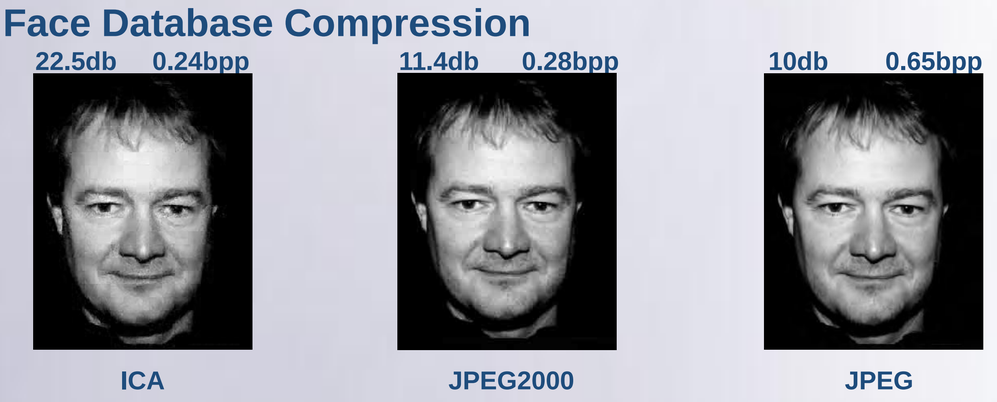
Filesize vs. SNR



Class Specific Image Compression

Fingerprint s Compression

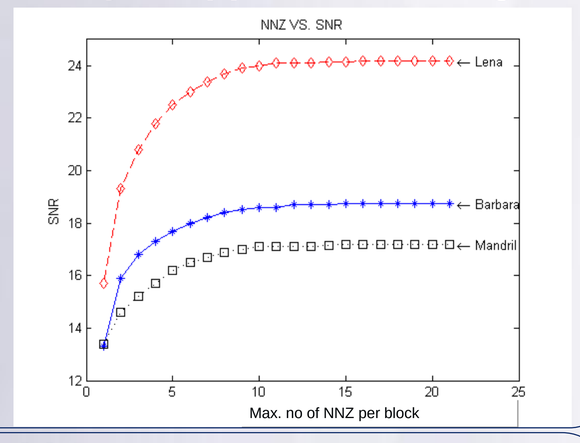
Face Database Compression



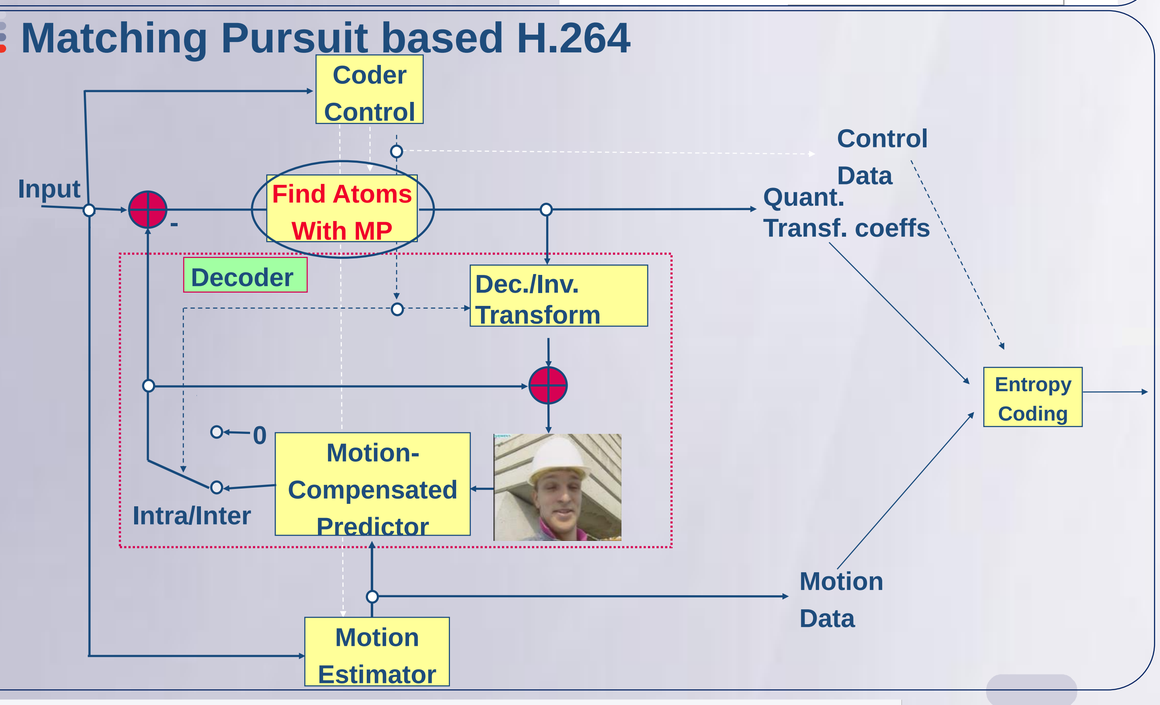
Better Image Approximation

ICA basis functions have capability to approximate image with very few coefficients.

Graph between max. no. of NNZ per block and acquired SNR. (Block size 16x16)



Matching Pursuit based H.264



Conclusion ans Perspectives

- ICA based Codec has given promising results both for natural images and class specific images.
- Decoder does have the same processing cost as DCT based decoder. So it can be used for encode-once decode many-time applications including image databases, movies.