



Special Module on Media Processing and Communication

Dayalbagh Educational Institute
(DEI)
Dayalbagh Agra

CSM 011

Indian Institute of Technology Delhi
(IITD)
New Delhi

SIV 864/8064



Recap

- ▶ Loss less compression
 - Huffman Coding
 - Entropy



Image Compression

Run Length Coding

Run: a string of the same symbol

Example

input: AAABBBCCCCCCCCCAA

output: A3B2C9A2

compression ratio = $16/8 = 2$



Image Compression

Predictive Coding

Basic premise: Current pixel is similar to the previous pixel (coherence)

Differential Coding

$$d(x,y) = I(x,y) - I(x-1,y)$$

$d(x,y)$ prediction error which is to be encoded.



Image Compression

Predictive Coding

Compression

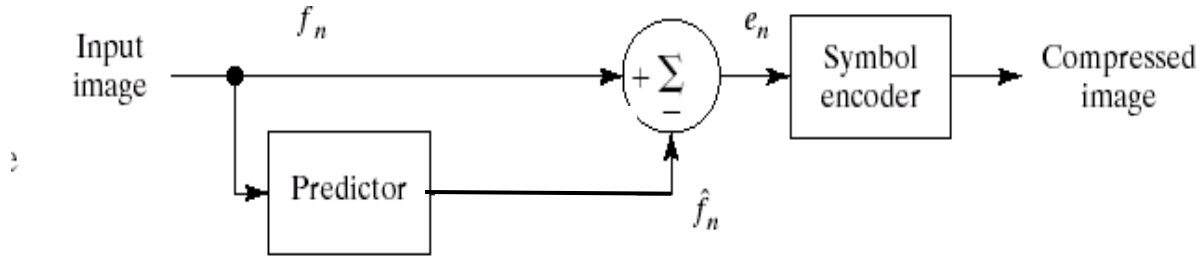




Image Compression

Predictive Coding

Decompression

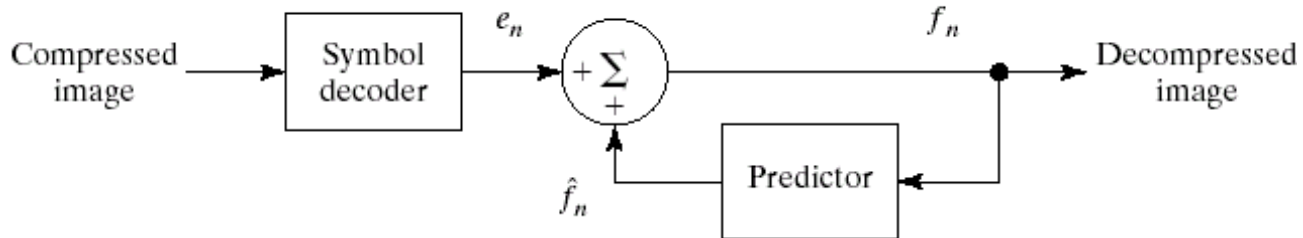




Image Compression

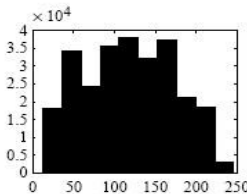
Predictive Coding



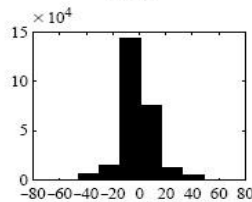
(a)



(b)



(c)



(d)

Distributions for Original versus Derivative Images. (a,b): Original gray-level image and its partial derivative image; (c,d): Histograms for original and derivative images.



Image Compression

Lossy

- Psychovisual redundancy
- Keep more important information
- Trade off between loss (degradation) and compression



Original



Compression Ratio: 7.7



Compression Ratio: 12.3



Compression Ratio: 33.9



Image Compression

Lossy



Original



Image Compression

Lossy



Compression Ratio 7.7



Image Compression

Lossy



Compression Ratio 33.9



Image Compression

Lossy

- Recall Quantization

Discrete value to represent range of values

Irreversible operation

Information loss !

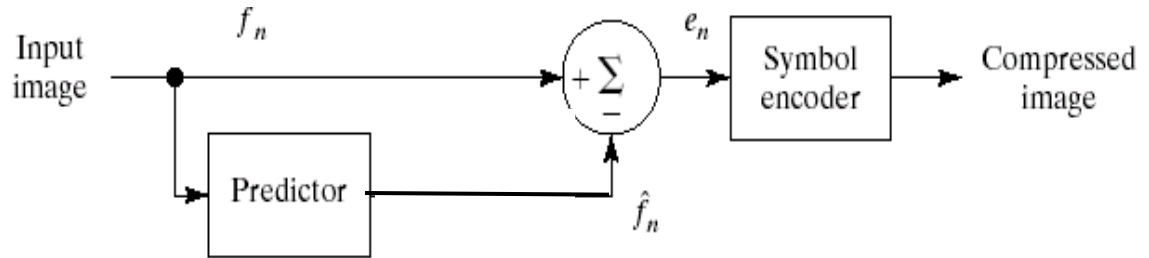
- Predictive Coding
- Transform Coding



Image Compression

Predictive Coding: Loss-less (Revisit)

Compression



Decompression

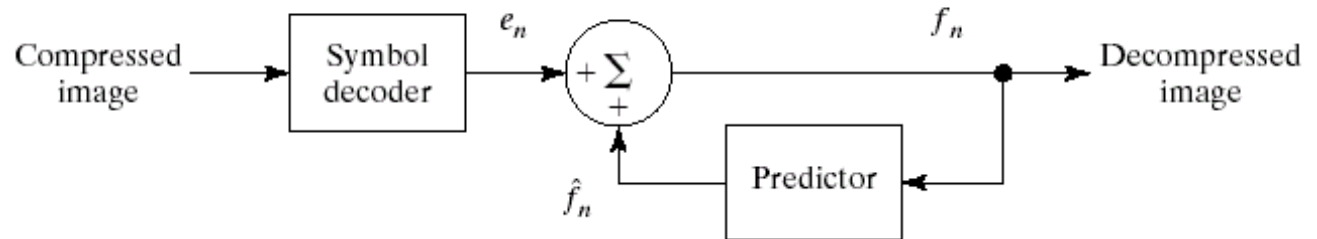
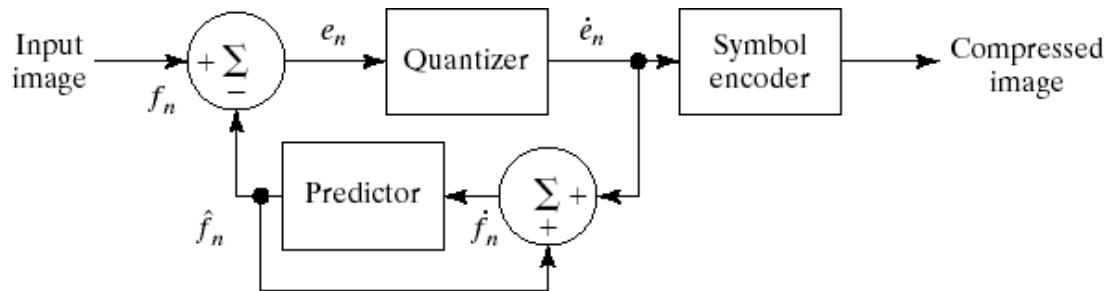




Image Compression

Predictive Coding: Lossy Compression



Decompression

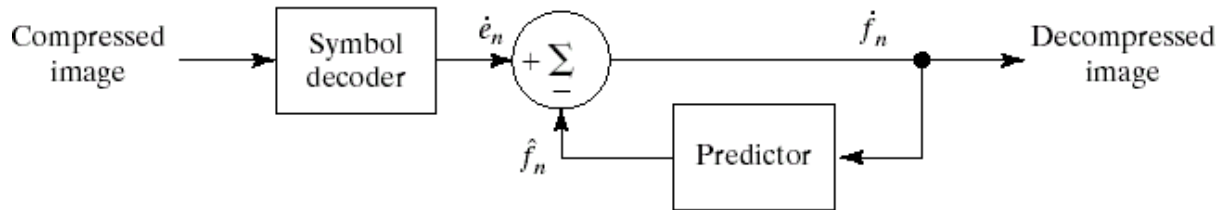




Image Compression

Predictive Coding: Lossy Delta Modulation

Example:

$$\hat{f}_n = \alpha \hat{f}_{n-1}$$

$$\text{and } \dot{e}_n = \begin{cases} +\xi & e_n > 0 \\ -\xi & e_n < 0 \end{cases}$$

$$0 < \alpha < 1$$

prediction coefficient

$$\begin{aligned} \dot{f}_n &= \dot{e}_n + \hat{f}_n \\ &= \dot{e}_n + \alpha \dot{f}_{n-1} \end{aligned}$$



FIGURE 8.22 An example of delta modulation.

Special Module on Media Processing and Communication