# Image Compression

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# Image Compression

- The field of image compression continues to grow at a rapid pace.
- As we look to the future, the need to store and transmit images will only continue to increase faster than the available.
- **capability to process all the data**
- Applications that require image compression are many and varied such as:
- 1. Internet,
- 2. Businesses,
- 3. Multimedia
- 4. Satellite imaging,
- 5. Medical imaging

# Image Compression

- Compression algorithm development starts with applications to two-dimensional (2-D) still images.
- After the 2-D methods are developed, they are often extended to video (motion imaging).
- However, we will focus on image compression of single frames of image data.
- *Image compression* involves reducing the size of image data files, while *retaining necessary information*
- Retaining necessary information depends upon the application.
- Image segmentation methods, which are primarily a data reduction process, can be used for compression .

# Models Image Compression

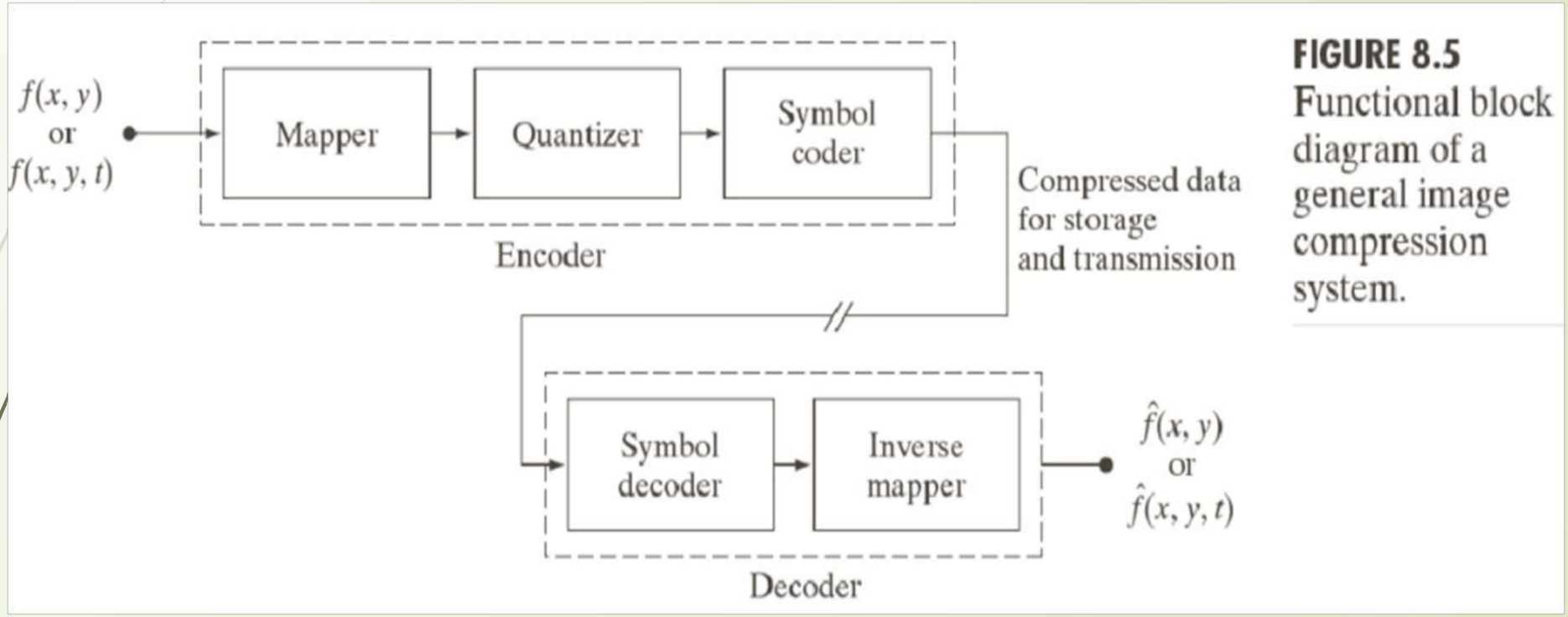
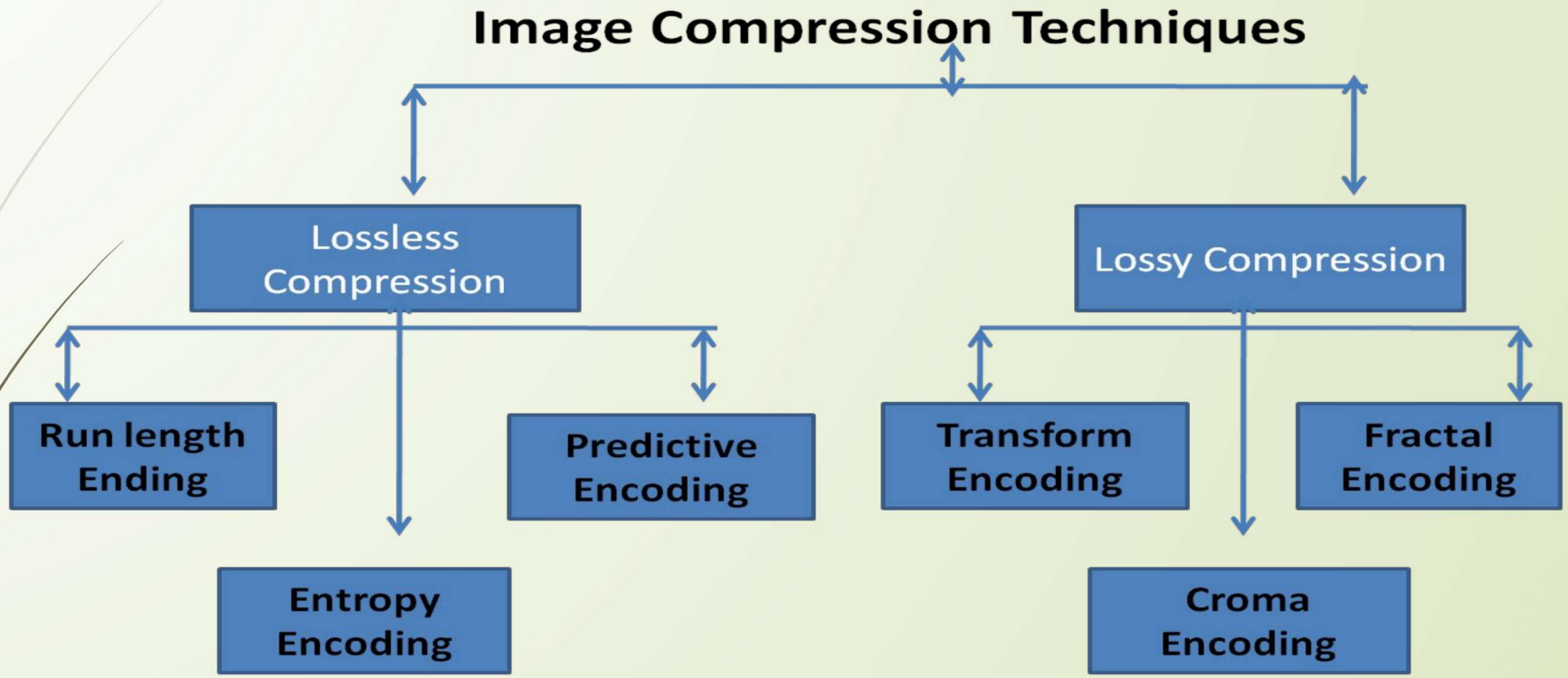



**FIGURE 8.5** Functional block diagram of a general image compression system.

# Models Image Compression

- **Mapper :** Reduces spatial and temporal redundancy, e.g. run-length coding and calculation of DCT (reversible)
- **Quantizer :** Removes irrelevant information, e.g. reduction of number of grey scales and removal of high frequency content (irreversible) • Symbol coder: Reduces coding redundancy, e.g. generates fixed- or variable-length code (reversible)
- Most probable symbol is assigned the shortest code word Variable-length coding • Used in, for example: CCITT, JBIG2, JPEG , MPEG-1,2,4, H.261, H.262, H.263, H.264

# Image Compression Techniques



# Image Compression Techniques

- Lossless Compression Techniques Lossless data compression techniques are applied on text data or scientific data and preferred for artificial images such as technical drawings, icons or comics. Lossless compression method may also be preferred for high value content, such as medical image scans made for archive purposes. Lossless compression is usually two steps algorithm. The first step transforms the original image to some other format in which the inter-pixel redundancy is reduced. The second step uses an entropy encoder to remove the coding redundancy. The lossless decompression is a perfect inverse process of the lossless compressor.

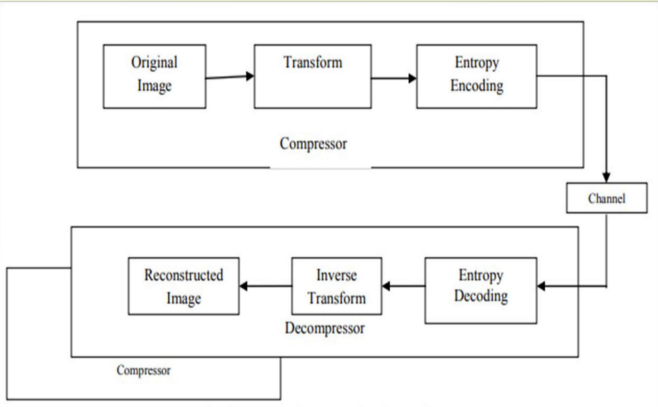
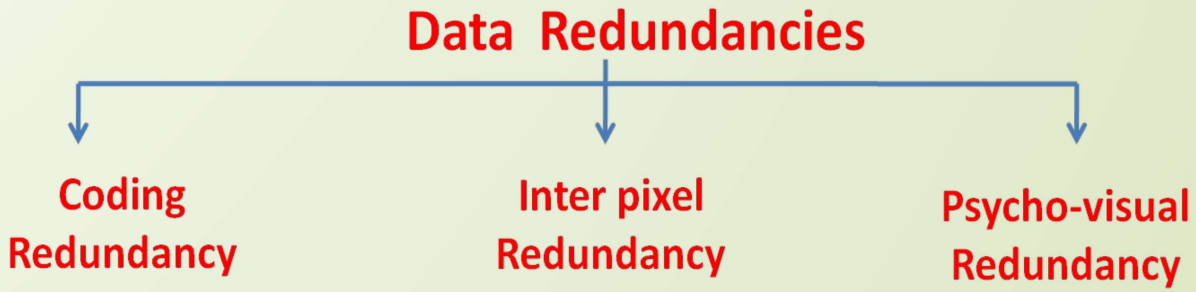



Fig. 3 Lossless Compression Techniques

# Redundancy of image compression

- Redundancy refers to **"Storing extra information to represent a quantity of information".**
- So that is the redundancy of data now apply this concept on digital images we know that computer store the images in pixel values so sometimes image has duplicate pixel values or maybe if we remove some of the pixel values they don't affect the information of an actual image. Data Redundancy is one of the fundamental component of **Data Compression.**



# Redundancy of image compression

- There are three main data redundancies used in image compression.
- **(1) Coding redundancy :** Coding redundancy is associated with the representation of information.
- The information is represented in the form of codes. If the gray levels of an image are coded in a way that uses more code symbols than absolutely necessary to represent each gray level then the resulting image is said to contain coding redundancy.
- **(2) Inter pixel redundancy :** This type of redundancy is related with the inter-pixel correlations with in an image. Much of the visual contribution of a single pixel is redundant and can be guessed from the values of its neighbours. Example- Consider an image with a constant background. The visual nature of the image background is given by many pixels that are not actually necessary.
- **(3) Psycho-visual redundancy :** Psycho visual redundancy is distinctly vision related, and its elimination does result in loss of information. Removing this type of redundancy is a lossy process and the lost information dose not recovered.

# Image Compression Standard

| Standard Name | Description |
|---|---|
| JPEG | JPEG is an image compression standard that was developed by the **"Joint Photographic Experts Group"**. JPEG was formally accepted as an international standard in 1992. |
| PNG | **Portable Network Graphics is** preferred over JPEG for more precise reproduction of source images, or when transparency is needed. |
| GIF | **Graphics Interchange Format** Good choice for simple images and animations. Prefer PNG for lossless *and* indexed still images, |
| AVIF | **AV1 Image File Format** Good choice for both images and animated images due to high performance and royalty free image format. |
| SVG | **Scalable Vector Graphics is** Vector image format; ideal for user interface elements, icons, diagrams, etc., that must be drawn accurately at different sizes. |
| WebP | **Web Picture format** Excellent choice for both images and animated images. WebP offers much better compression than PNG or JPEG with support for higher color depths, animated frames, |
| APNG | **Animated Portable Network Graphics** Good choice for lossless animation sequences (GIF is less performant). AVIF and WebP have better performance but less broad browser support. |