# Presentation Formatting

COS 460/540

# End to End Data

- Data Formats

- eXtensible Markup Language

- Multimedia Data

# Data Formats

- Basic data types

- Complex types and data

  - "records", audio, video, ...

- Sequences

# Complex Types

- Compression

  - ...to reduce bandwidth needs

- Error Correction

  - ...to increase reliability

# Transmitting Data

- Encoding

  - ...from model to network

- Decoding

  - ...from network to model

# XML

## eXtensible Markup Language

- Data and Tags/Markup (XML)

- Schema description of documents (XSD)

```xml
<?xml version="1.0"?>
<catalog>
   <book id="bk101">
      <author>Gambardella, Matthew</author>
      <title>XML Developer's Guide</title>
      <genre>Computer</genre>
      <price>44.95</price>
      <publish_date>2000-10-01</publish_date>
      <description>An in-depth look at applications
      with XML.</description>
   </book>
   <book id="bk102">
      <author>Ralls, Kim</auth
```

# XML

- Based on Web Technologies

- Data and Markup are TEXT

- XML is a "framework"

- Nested tags/values

- Sequences of tags/values

```xml
<xsd:schema xmlns:xsd="http://www.w3....XMLSchema"
        targetNamespace="urn:books"
        xmlns:bks="urn:books">
 <xsd:element name="books" type="bks:BooksForm"/>
 <xsd:complexType name="BooksForm">
  <xsd:sequence>
   <xsd:element name="book"
          type="bks:BookForm"
          minOccurs="0"
          maxOccurs="unbounded"/>
  </xsd:sequence>
 </xsd:complexType>

 <xsd:complexType name="BookForm">
  <xsd:sequence>
   <xsd:element name="author"   type="xsd:string"/>
```
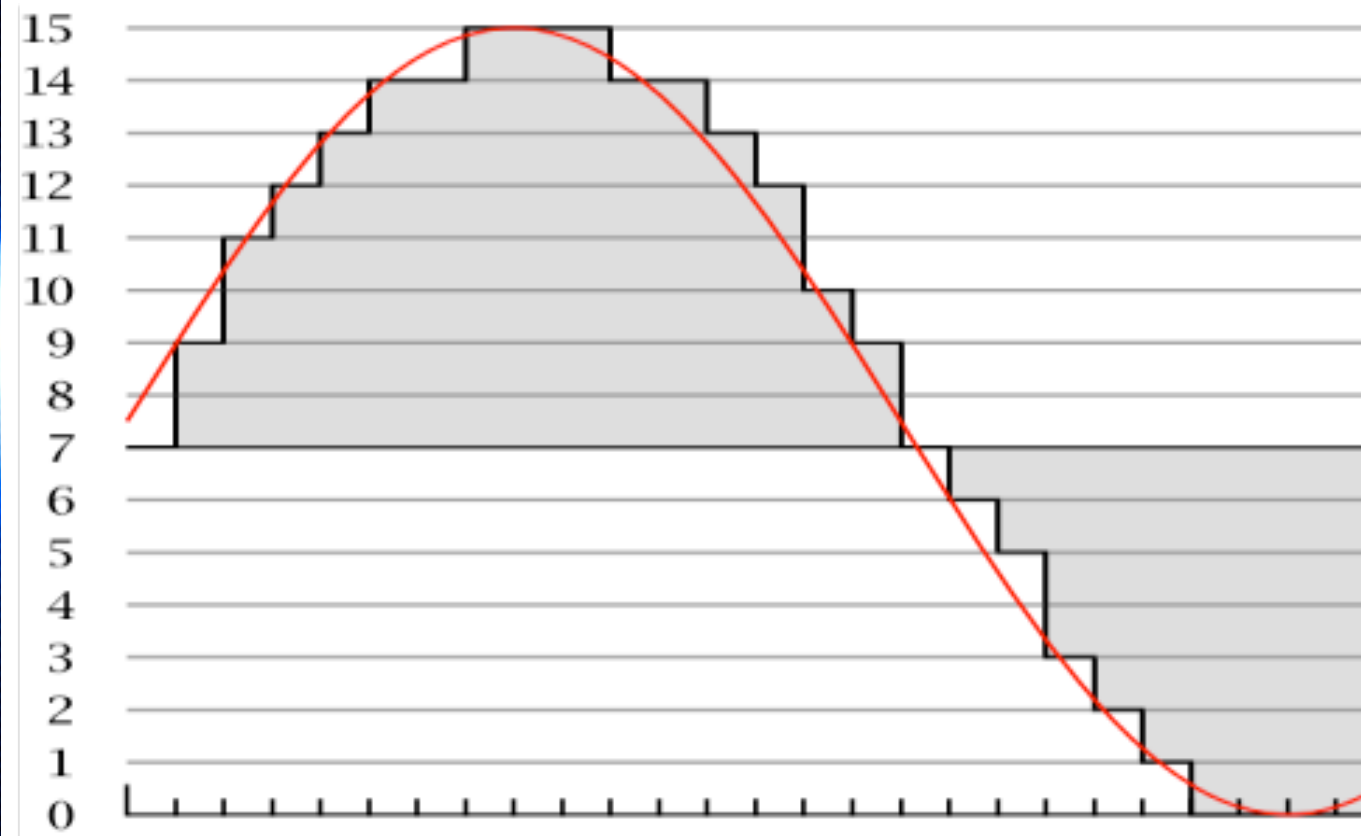
# XSD

- Defines valid XML Documents

- Written in XML

- Basic types: integer, string, boolean

- Complex types: nesting, sequences

- Namespaces to avoid name conflicts

# Multimedia Data

- The nature of multimedia data

- Compression

  - Lossless (for data)

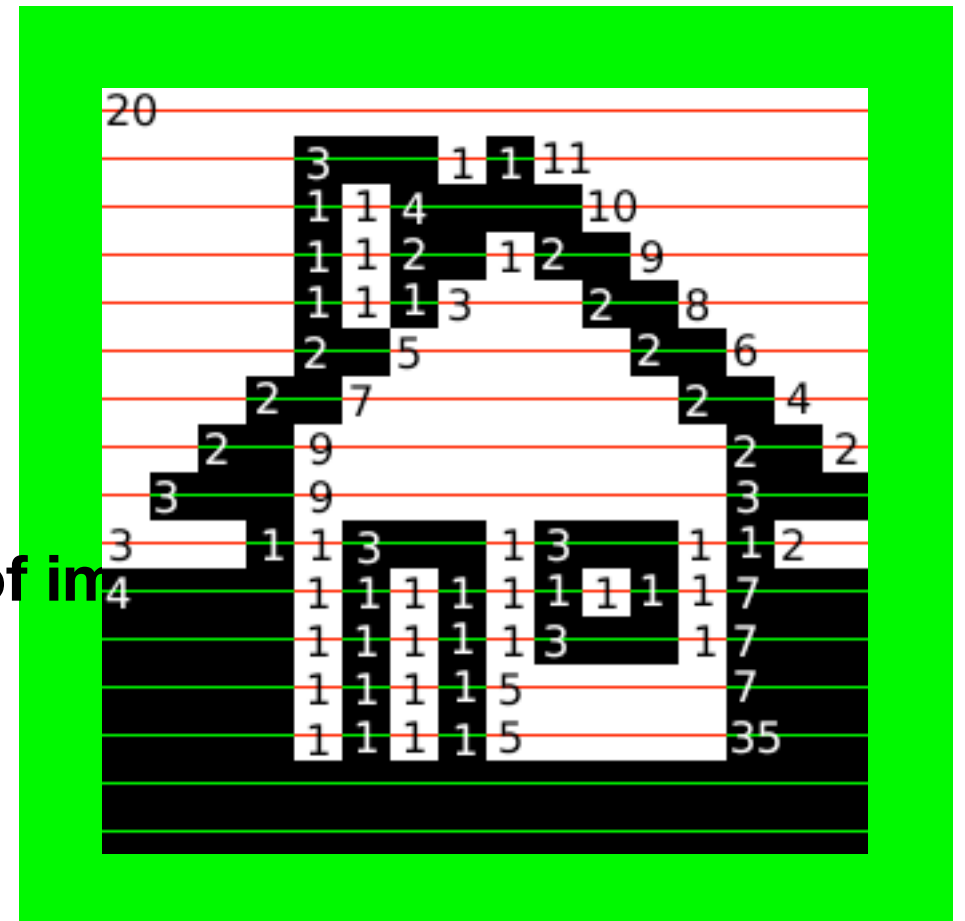  - Lossy (for images, video, audio)

# Audio

# Sampling

- Sampling (time)

- Quantization (quantity, e.g. amplitude)

# Images & Video



ence of im

# That's a lot of data!

**1080** x **1920** x **24** = **50Mb**

24fps = 1.2Gbps

# Lossless Compression

## All the data are important

- Run Length Encoding

- Differential Pulse Code Modulation

# Run Length Encoding

**AAABBCDDDDDDAAAAABCCC** 21B

# DPCM

**AAABBCDDDDDDAAAAABCCC**

# Huffman Code



**Morse Code**

# LZW - Dictionary
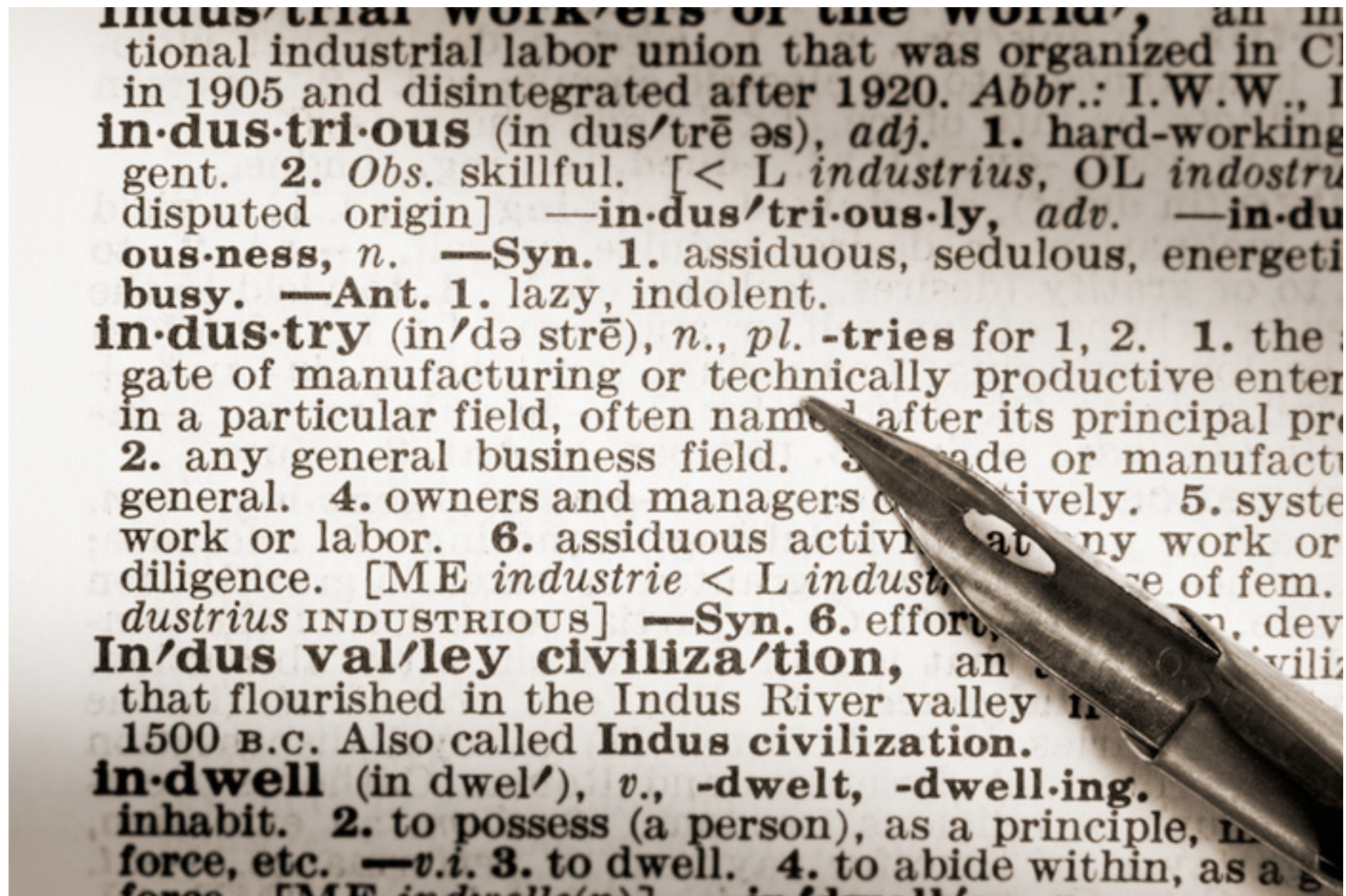
# Lossy Compression

All the data are

**NOT** important

- Single image compression

- Stream compression
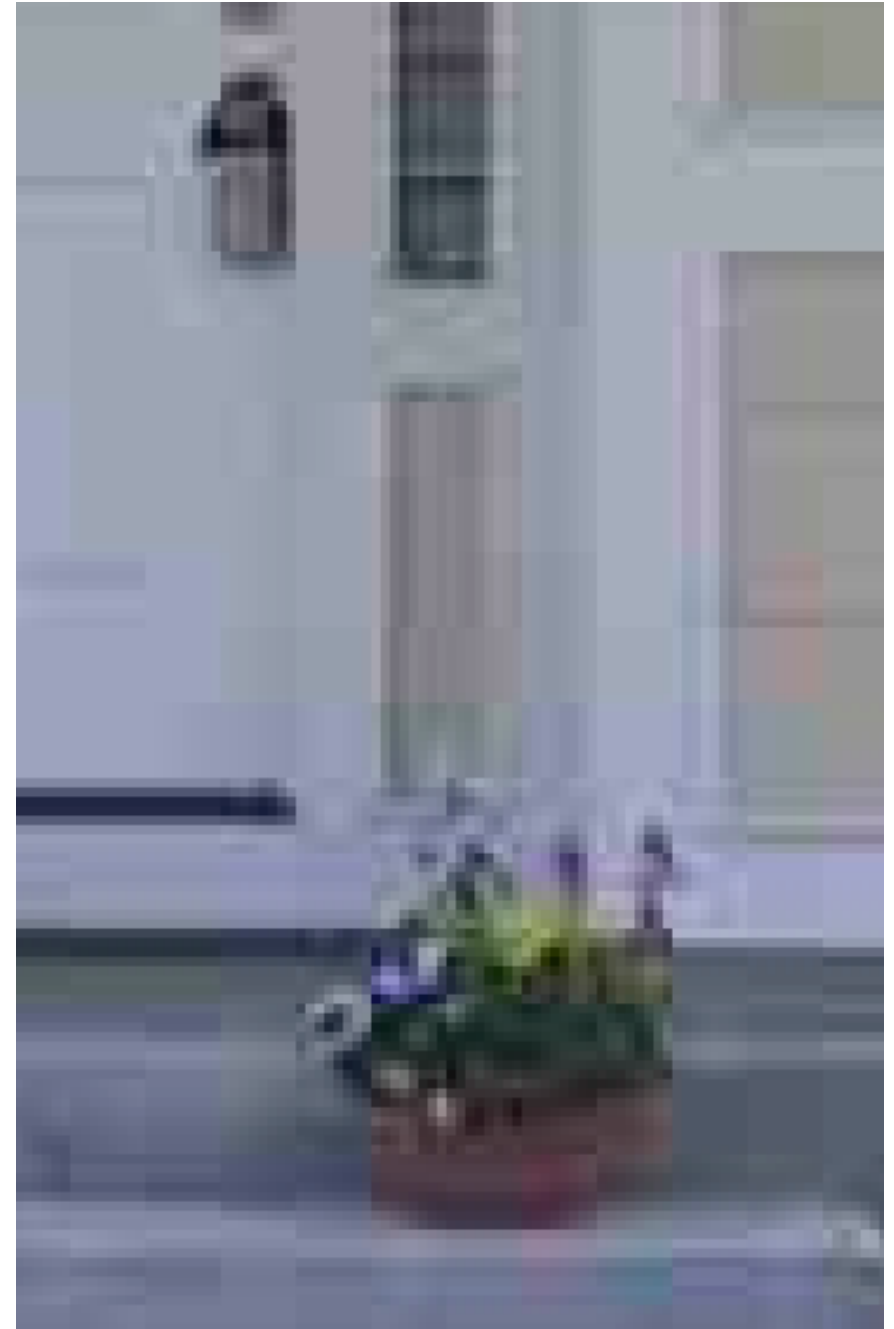
# MP3 (audio)
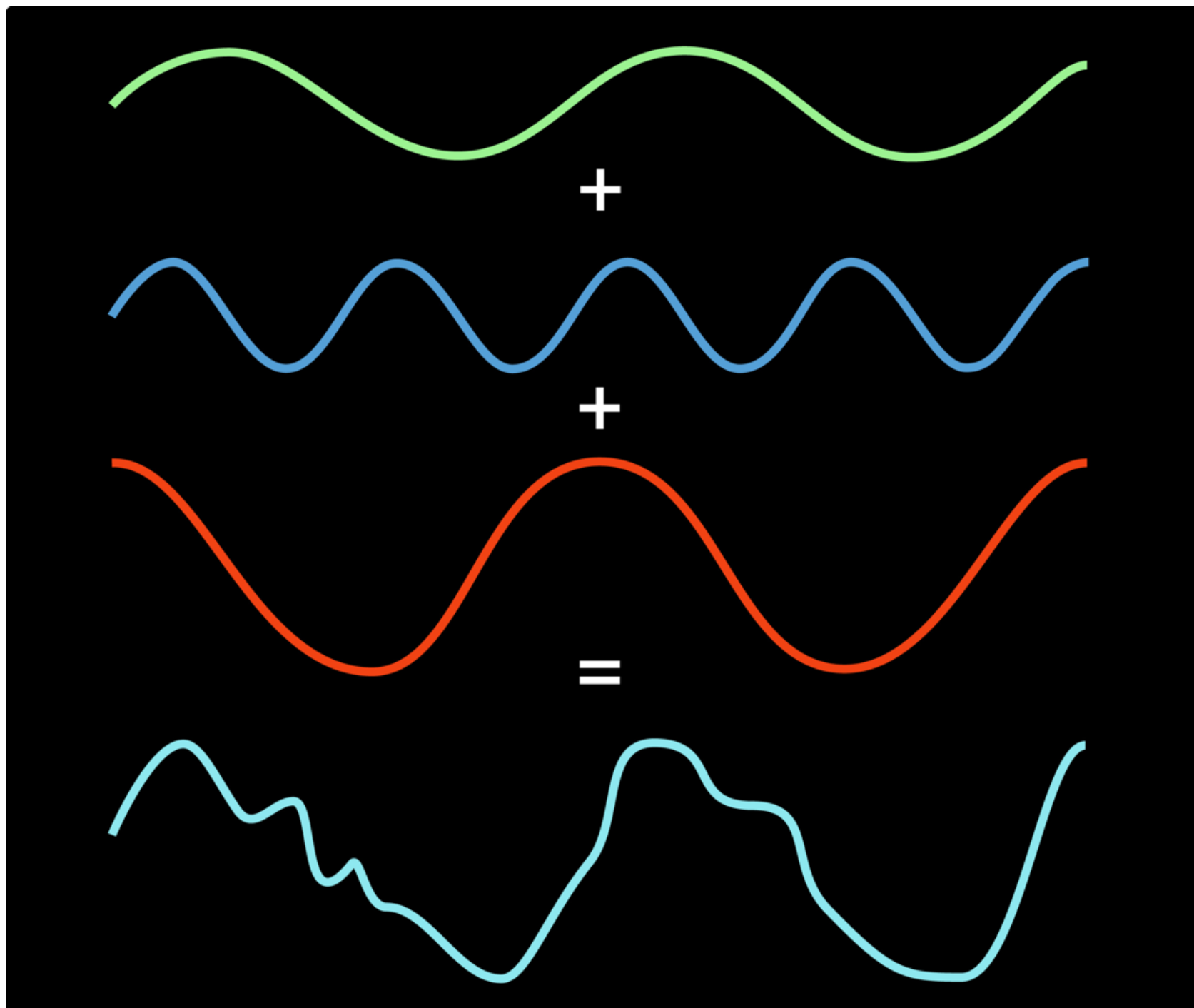
# Signal Reduction (masking)



Masked signal

Threshold of audibility

Masking signal at 150 Hz

Power (dB)

80

60

40

20

0

.02  .05  .1  .2  .5  1  2  5  10  20

Frequency (kHz)

SOS
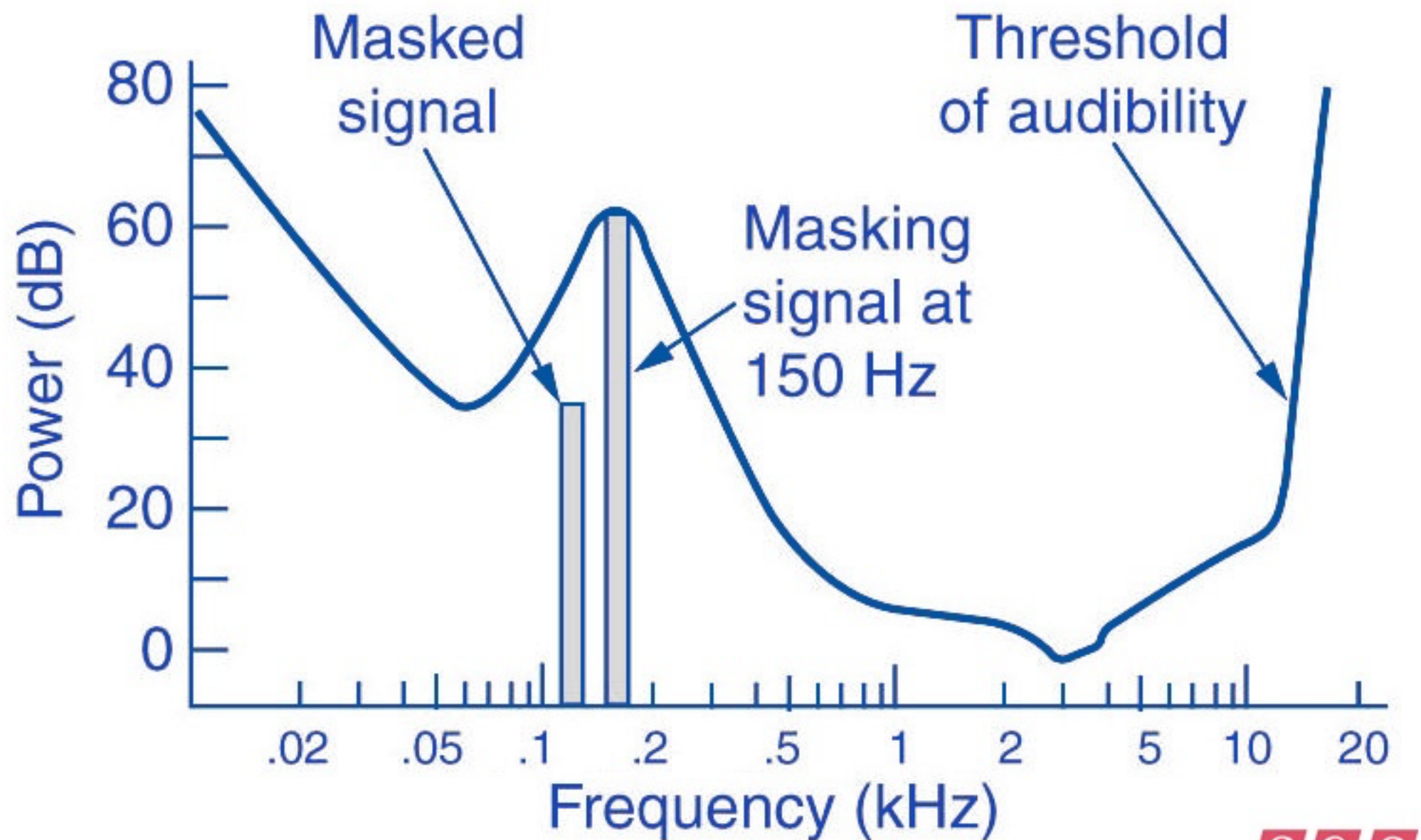
# Bitrate?

- 24Kbps = Spoken word (telephone)

- 48-64Kbps = AM Radio

- 128Kbps = reasonable for car-radio, falls off over 16KHz (cymbals)

- 192KBps = 'near CD quality'

- >= 256Kbps = identical to original up to about 18KHz

# CBR vs VBR

- Constant

  - Same bitrate throughout the stream

- Variable

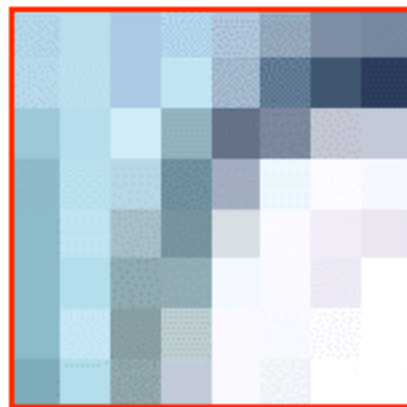  - bitrate changes based on content analysis

# Images & Audio

# JPEG


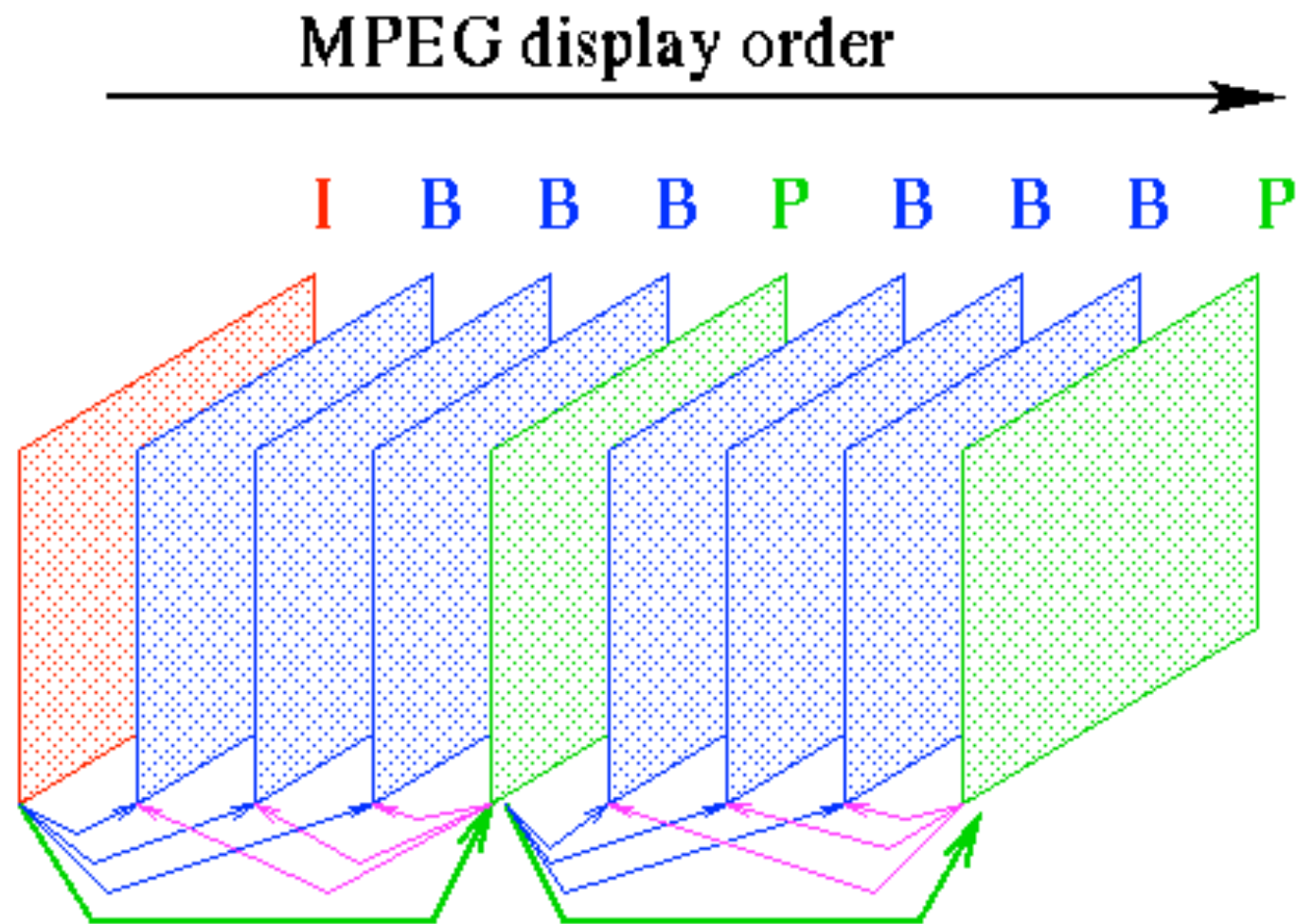
Resolution 720x572 pixels

Block at 8x8 pixels          Color value matrix          DCT coefficients

# MPEG



MPEG display order

I B B B P B B B P
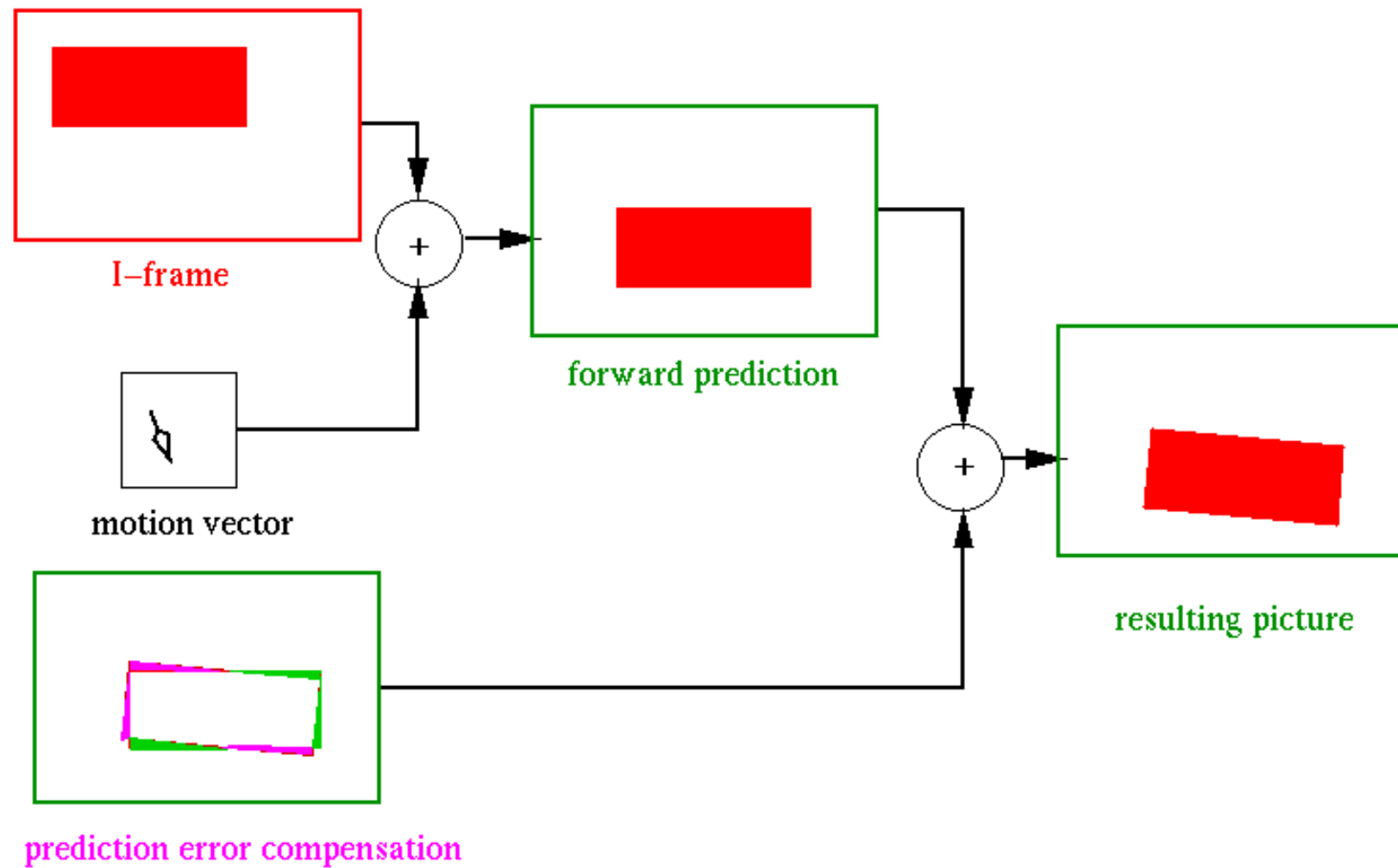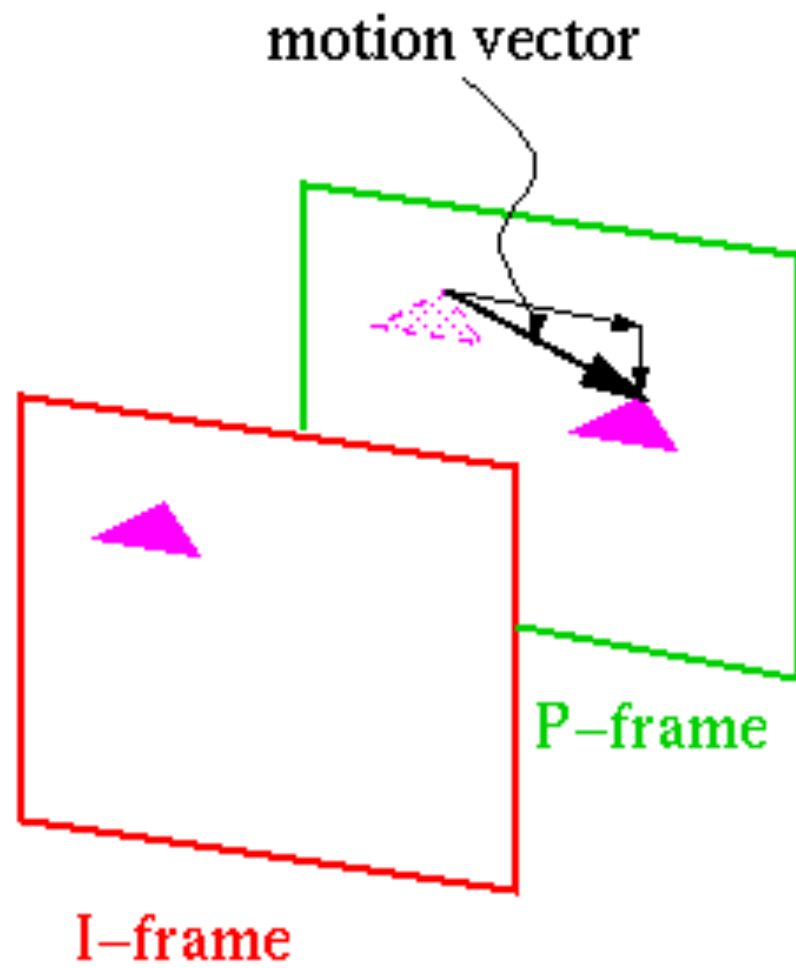
forward prediction of P –frames

forward prediction of B–frames

backward prediction of B–frames

# Prediction

# End

Presentation Formatting
XML