Multimedia System and Design

(Video)

Broadcast Video Standards

National Television Standards Committee (NTSC):

Named after the National Television Systems Committee, which developed it, this standard is used in all of North and South America, except Brazil, and in much of East Asia.

- These standards define a method for encoding information into electronic signal that creates a television picture.
- It has screen resolution of 525 horizontal scan lines and a scan rate of 30 frames per second.

Broadcast Video Standards

Phase Alternate Line (PAL) and Sequential Color and Memory (SECAM):

PAL standard is used in western Europe, including the United Kingdom but excluding France, and in East Asia, including Australia.

SECAM standard is used in France, eastern Europe, the Near East and Mideast, and parts of Africa and the Caribbean.

- **PAL has a screen resolution of 625 horizontal lines and a scan rate of 25 frames per second.**
- **SECAM has a screen resolution of 625 horizontal lines and is a 50 Hz system.**
- **SECAM differs from NTSC and PAL color systems in its basic technology and broadcast method.**

Broadcast Video Standards

Advanced Television Systems Committee (ATSC) Digital Television (DTV):

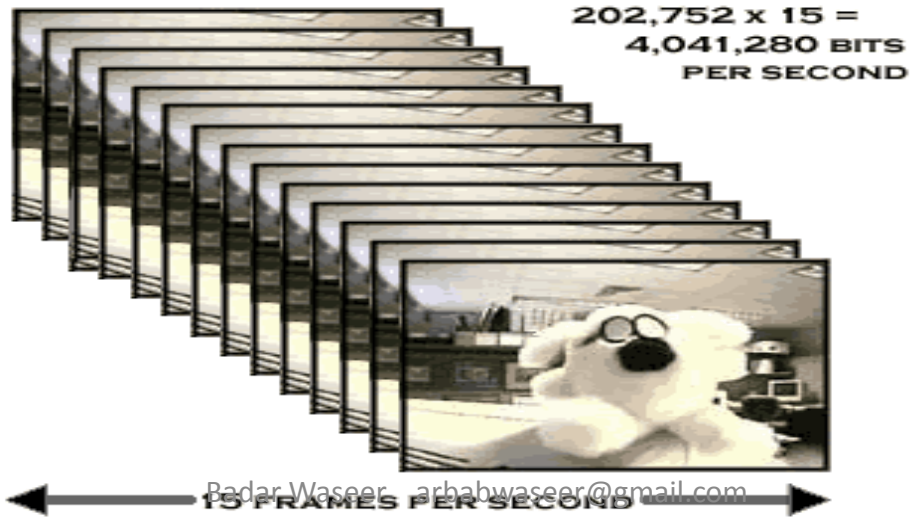
- This digital standard provides TV stations with sufficient bandwidth to present four or five Standard Television (STV) signals or one High Definition TV (HDTV) signal.
- This standard allows for transmission of data to computers and for new Advanced TV (ATV) interactive services.

File Size and Formats

- There is an important consideration:
  - file size in digitized video which included
    1. frame rate
    2. image size
    3. color depth.

File Size and Formats

1. Frame Rate
   - Animation is an illusion caused by the rapid display of still images.
   - Television and movies play at 30 fps but acceptable playback can be achieved with 15 fps.



File Size and Formats

2. Image Size

- A standard full screen resolution is 640x480 pixels but to safe storing space a video with 320x240 for a computer display is still acceptable.
- New high-definition televisions (HDTV) are capable of resolutions up to *1920×1080p60*,
  - 1920 pixels per scan line by 1080 scan lines, progressive, at 60 frames per second.

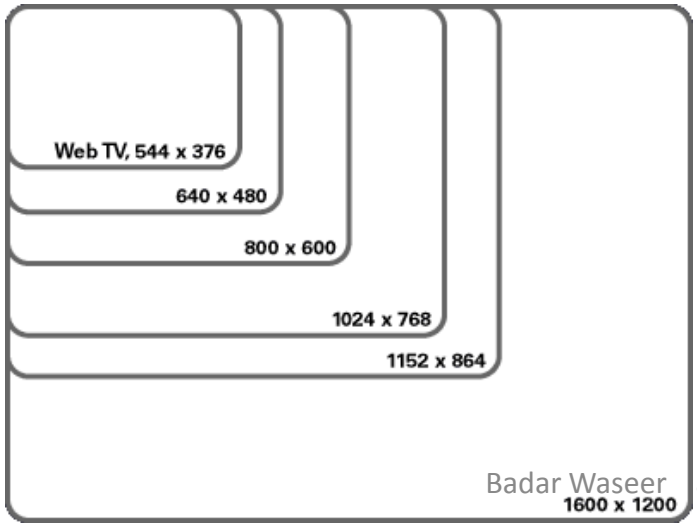


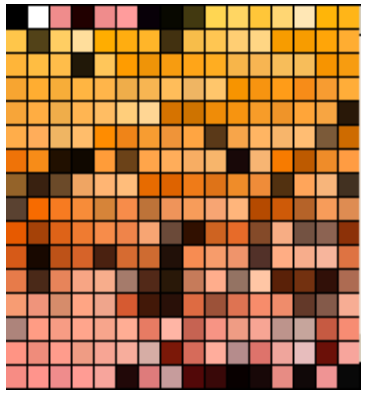
image resolution mean

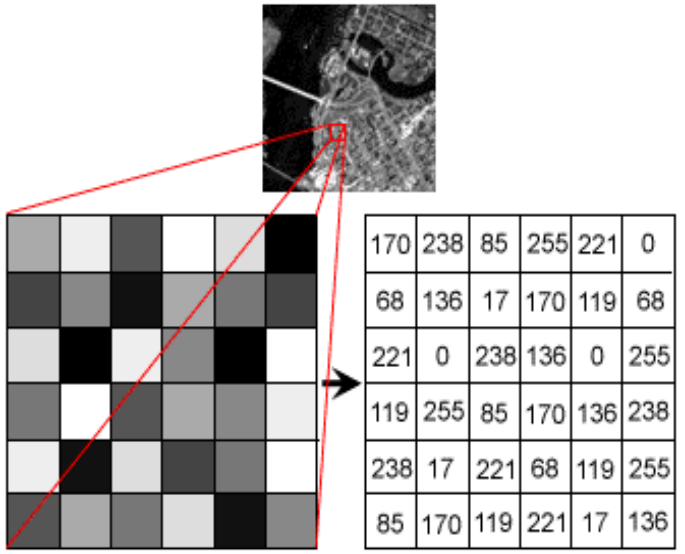
- Resolution refers to the number of pixels in an image.
- Resolution is sometimes identified by the width and height of the image as well as the total number of pixels in the image.
- For example, an image that is 2048 pixels wide and 1536 pixels high (2048X1536) contains (multiply) 3,145,728 pixels (or 3.1 Megapixels).

File Size and Formats

3. Color Depth

– The quality of video is dependent on the color quality (related to the number of colors) for each bitmap in the frame sequence.





File Size and Formats

3. Color Depth

- **The color depth below 256 colors is poorer-quality image.**
- **The frame rate to below 15 fps causes a noticeable and distracting jerkiness that unacceptable.**
- **Changing the *image size* and *compressing* the file therefore become primary ways of reducing file size.**

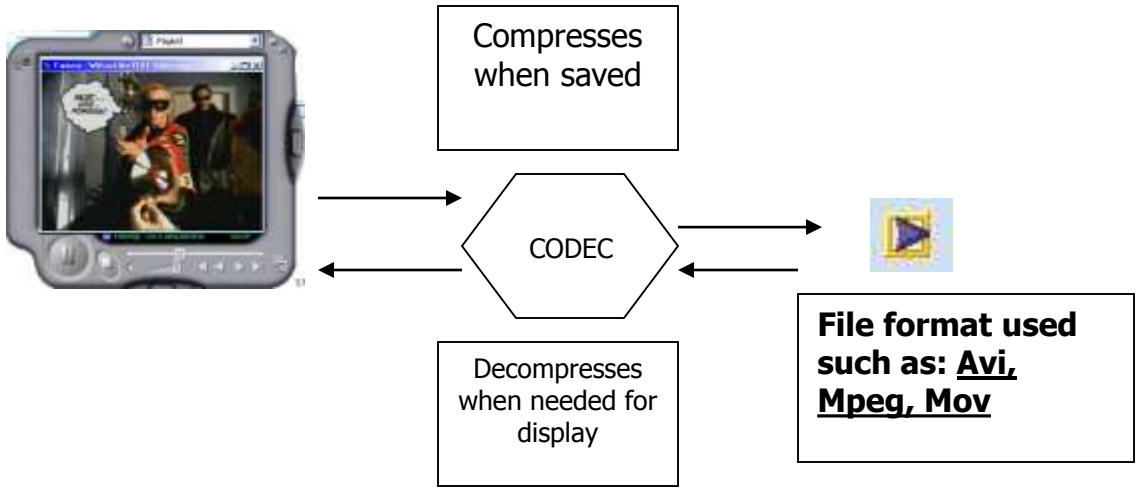
24 bit

16 bit

8 bit (256 colors)

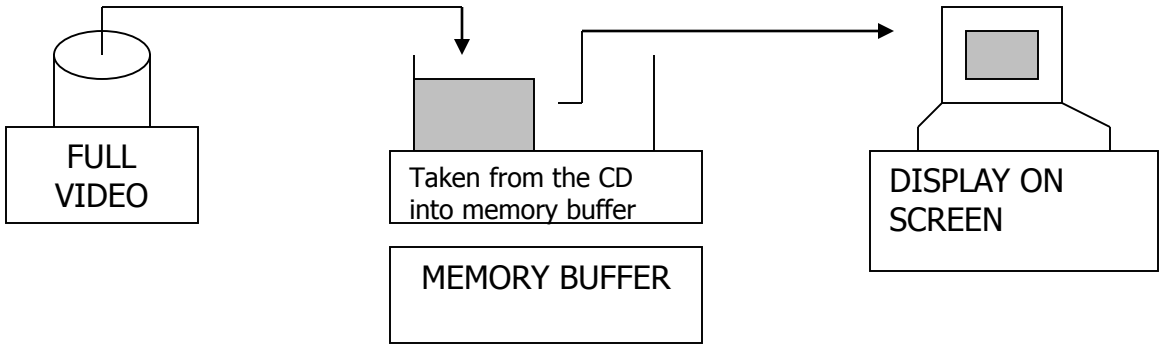
Video Compression

- The video compression/decompression programs are used so that video can fit on a single CD and the speed of transferring video from a CD to the computer can be increased.
- Let us say that a sequence of 25fps video is about 25MB.
- CD-ROM transfer rate is calculated as follows:
  - 1X= 150KB per second
  - 10X=1.5 MB per second
  - 100X= 15 MB per secondt
- To overcome large video size, CODECS were developed.



Video Compression

- Digital video compression schemes or codecs is the algorithm used to compress (code) a video for delivery.
- The codec then decodes the compressed video in real-time for fast playback.
- Streaming audio and video starts playback as soon as enough data has transferred to the user's computer to sustain this playback.

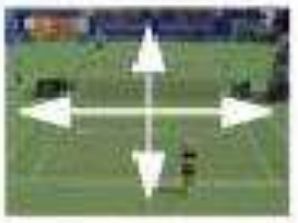


Video Compression

- Two types of COMPRESSION:
  - Lossy compression.
    - Eliminates some of the data in the image and therefore provides greater compression ratios than lossless compression.
    - Applied to video because some drop in the quality is not noticeable in moving images.

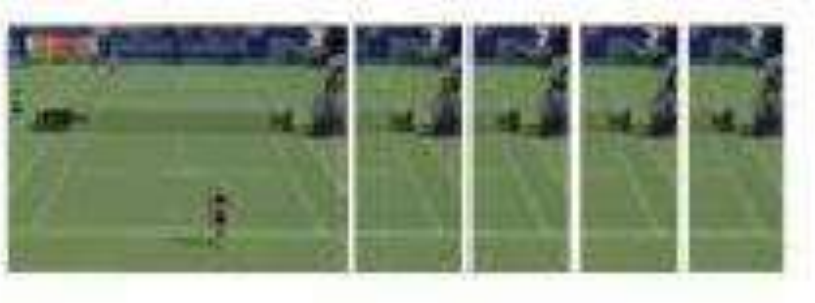
Video Compression

- Two types of CODEC (lossy):
  - **Spatial compression**
    - A digital compression of video data that compresses the size of the video file by compressing the image data of each frame
    - Compression is done by removing redundancy from data in the same frame.



Video Compression

- Two types of CODEC:
  - **Temporal compression**
    - A digital compression of video data that uses similarities of sequential frames over time to determine and store only the image data that differs from frame to frame.
    - Compression is done by removing similarity between successive video frames



Video Compression

- Flavors of file formats brand to choose:
  - Microsoft's AVI format
  - QuickTime
  - MPEG
  - Div-X
  - Wmv (Windows Media Video)

Video Compression

- Standards have been established for compression programs, including **JPEG** (Joint Photographic Experts Group) and **MPEG** (Motion Picture Experts Group).

JPEG (Spatial)

- Often areas of an image (especially backgrounds) contain similar information.
- JPEG compression identifies these area and stores them as blocks of pixels instead of pixel by pixel reducing the amount of information needed to store the image.
- These program reduce the file size of graphic images by eliminating redundant information.

MPEG (Temporal)

- The changes in the image from frame to frame.
- Key frames are identified every few frames the changes that occur from key frame.
- Provide greater compression ratios than JPEG.
- Initially, it requires extra hardware for multimedia.

Advantages of using Video

- Captures interest
- Increase retention
- Clarifies complex physical actions and relationships
- Can incorporate other media

Disadvantages of using Video

- Is expensive to produce
- Requires extensive memory and storage
- Requires special equipment
- Does not effectively illustrate abstract concepts and static situations

Summary

- Digital video method is used for making and delivering video for multimedia.
- Compression techniques help to reduce the file sizes to more manageable levels
- Two types of compression lossless and lossy.
- Standards for compression program are JPEG and MPEG.

Analog Vs Digital

	Analog	Digital
Signal	Analog signal is a continuous signal which represents physical measurements.	Digital signals are discrete time signals generated by digital modulation.
Waves	Denoted by sine waves	Denoted by square waves
Representation	Uses continuous range of values to represent information	Uses discrete or discontinuous values to represent information
Example	Human voice in air, analog electronic devices.	Computers, CDs, DVDs, and other digital electronic devices.
Technology	Analog technology records waveforms as they are.	Samples analog waveforms into a limited set of numbers and records them.
Data transmissions	Subjected to deterioration by noise during transmission and write/read cycle.	Can be noise-immune without deterioration during transmission and write/read cycle.
Response to Noise	More likely to get affected reducing accuracy	Less affected since noise response are analog in nature

Analog Vs Digital

Response to Noise	More likely to get affected reducing accuracy	Less affected since noise response are analog in nature
Flexibility	Analog hardware is not flexible.	Digital hardware is flexible in implementation.
Uses	Can be used in analog devices only. Best suited for audio and video transmission.	Best suited for Computing and digital electronics.
Applications	Thermometer	PCs, PDAs
Bandwidth	Analog signal processing can be done in real time and consumes less bandwidth.	There is no guarantee that digital signal processing can be done in real time and consumes more bandwidth to carry out the same information.
Memory	Stored in the form of wave signal	Stored in the form of binary bit
Power	Analog instrument draws large power	Digital instrument drawS only negligible power
Cost	Low cost and portable	Cost is high and not easily portable