Digital video: Convergence of Broadcast and Streaming

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Video Quality and Digital Files

How does Video Quality Affect Digital Files?

Production Techniques

Is “technical” quality the only thing?

Working with Talent
Frame Sample Rates for Uncompressed Video

Full frame = 640 x 480 pixels
640 x 480 x 30 frames per second = 9,216,000 pixels

Each pixel needs 24 bits for color
9,216,000 x 24 = 221,184,000 bits
221,184,000 bits/8 bits/byte = 27,648,000
27,648,000 bytes/1024 bytes/KB = 27,000 KB
27,000 KB/1024 KB/MB = 26.4 MB
26.4 MB per second of video

1.5 GB per minute
Key frame is a reference frame that contains information about the whole frame.

Difference Frame contains only information about the current frame that is different from the previous frame.
Key Frames and Movement

Key frame is a reference frame that contains information about the whole frame.

Difference Frame contains only information about the current frame that is different from the previous frame.

More movement makes more difference frames.
What affects does movement have on the digitized video?

• All movement affects the encoding

• Encoders try to minimize movement
  • Inter-frame compression
    • Small areas of movement, such as a mouth on a talking head, are digitized, static areas are not.
  • Motion Detection
    • Moving objects are not digitized each frame, just moved, e.g. a boat moving across the frame.
Some movements cause more problems for encoders

- Busy backgrounds, such as crowds or moving leaves, adds to movement.
- Unsteady cameras adds to movement.
- Zooms, pans and tilts cause more movement.
- Dissolves, wipes and other special effects cause more movement.
- Animated graphics add movement.
Steps to minimize movement

- Use static backgrounds
- Use tripods
- Limit unnecessary camera movement
- Use cuts rather than fancy transition effects
- Static graphics
Noise is any artifact recorded in the video that was not part of the original scene. This often is seen as sparkles, black dots, graininess, blocky spots and fuzziness.

Noise tends to be random and can last on the video for as little as one frame.

The encoder sees noise as movement and encodes more frames.
What adds noise to video?

• Video Cameras
  ▪ Old tube cameras add a lot of noise
  ▪ Digital cameras use light sensitive “chips.”
    ▪ Consumer cameras use a single chip, broadcast cameras use three chips.
      ▪ The quality and number of chips will determine how well the camera will record in “low light” settings.
      ▪ The Gain Control helps record in low light, but adds noise.
  ▪ The lens has a big influence on light sensitivity and sharpness of the image.
What adds noise to video?

• Video Tape
  - Still most cost effective storage medium.
  - Quality varies between brands and formats.
  - Analogue formats (VHS, BetacamSP) are more susceptible to noise.
  - Digital formats (DVCam, BetacamSX) maintain the digital quality of the digital video signal.
  - Amount of information recorded on tape affects quality.
    - DVCam records more digital information than MiniDV but less than BetacamSX.
  - Dropouts can affect any tape format.
How to reduce noise

• Use the best camera you can afford.
  ▪ 3 chips and a good lens

• Use a professional grade tape format
  ▪ Use good quality brand video tape
  ▪ Don’t over use the video tape
  ▪ Don’t make multiple generation dubs of tape (more of a problem with analogue formats)

• Use proper lighting techniques to bring lighting level up to camera’s recommended levels.
Does improving the quality only have an effect on the encoding?

Of course not, quality also affects the viewing experience for television as well as for streaming files!
The TV Wasteland Zone
Graphics on Television

TV has lower resolution than computer
- SDTV has 752 x 525 lines
- Monitors: 1024 x 769 to 1600 x 1200

What looks fine on computer looks bad on TV
What looks bad on TV is unreadable on streaming video
Resolution

- 752 x 525
- 1024x768
- 1152x864
- 1600x12000
Requirements for TV Graphics

Size
Color
Format
Convert
Font Style

Large and Bold

Thin serif styles don’t work

These fonts work well on TV

- Arial
- Helvetica
- Palatino
- Lucida Sans
- MS Sans Serif
Font Size

Minimum Size: 18 Points

Optimal Size:
- 24 Points
- 32 Points

Big and Bold
Small and Busy Graphics

Small Lines do not work

- $\frac{3}{4}$ pt
- 1 pt
- $2 \frac{1}{4}$ pt
- 3 pt
- $4 \frac{1}{2}$ pt
- 6 pt
Small and Busy Graphics

Small

Moiré Effect

Busy
Avoid Highly Saturated Colors

- Color Saturation = 200
- Luminance = 100

HIGH SATURATION

HIGH LUMINANCE
Background Color

Darker Colors Work Well

- Contrast with Text
- Yellow and Off White work well for text

- Light Colors come to the front

Avoid Busy Backgrounds
Video Format

Video screen is 3 x 4 format

Safe Title Area, at least 1” from edge of screen.
It is possible to put too much on a screen. First, it will be impossible for anyone to read everything, especially if someone is speaking. If you have a lot of information it would be best to use multiple slides. Of course some speakers have told me that they need to put a lot of information on the screen even if it is just to illustrate that there is a lot of stuff on the screen. For example, that is what is going on here. I'm only putting all this stuff on the screen to show you that it is impossible to read. For example, I wouldn't really need to use spell checker right about now because no one will read this. Because this is not a book, besides that I don't write that well. But you know the real reason for PowerPoint slides is to take the place of those 3x5 cards we used to use at Toastmasters. The role of slides is not to help communicate to the audience but to help the speaker keep track of where the hell he, or she, is in the talk because most people have not figured out about teleprompters, something that most politicians and news anchors use.
Spacing between lines should be 1.5 or 150% of the line height.

Don’t Underline with thin lines.

Stand 10 feet away from the computer monitor, can you still read it?
Graphics on Streaming Video

All restrictions of TV graphics are amplified when streaming

- Less Resolution
- Smaller Size
- Does not handle color as well

Advantages

- Images don’t move
- Higher encoding rates can handle graphics
Working with Talent

- The talent is anyone speaking in front of the camera. This is often a professor or instructor.
- Communicate and set expectations.
  - Explain production process.
  - Talk about cameras, lights and microphones.
  - Explain restrictions and why they are necessary.
  - Talk about make-up and clothes.
  - Decide on best way to handle the audience questions.
  - Decide how the lecture will begin and end.
The Talent Zone
Let’s take a break...........