ANALOG AND DIGITAL VIDEO

Henning Schulzrinne
Columbia University
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with material from Mark Handley
Video & image sources

- VGA video (computer video output)
  - component video
  - R, G, B + H (horizontal sync), V (vertical sync)
- Analog video from cameras
  - NTSC or PAL coded color
  - composite or component video
- Digital images
  - scanners, copiers and fax machines
  - digital cameras
- Images = still pictures
- Video = motion pictures
Example: DVI connector

video only (no audio)
Example: HDMI connector

- fully digital signal
- audio
- video (similar to DVI)
- remote control signals
- no closed captioning
Analog TV: CRT

cathode
anode
phosphor-coated screen
conductive coating
shadow mask
TFT LCD
Analog TV
How many frames?

- Movies use 24 fps
  - Not scanned – just photographs
  - Flicker, with undersampling (stroboscopic) problems
  - dark environment $\rightarrow$ less sensitivity to flicker

- TV
  - scanned
  - fairly bright environment
  - $\rightarrow$ use *interlacing* to reduce flicker
Interlacing
Interlacing artifacts

motion

scene change
Composite video

horizontal retrace
vertical: 400-500 µs
Color
Color

metamerism: tristimulus values

additive
Subtractive color: printing

- yellow (complement of blue)
- magenta (complement of green)
- cyan (complement of red)
Color representation

- Luminance \((Y)\) = brightness
- Chrominance
- RGB (red, green, blue)
  - basic analog components
- \(Y P_b P_r (Y, B-Y, R-Y)\)
  - color space for component video
  - YUV
  - YCbCr
    - digital representation
Color mapping

- True color
  - RGB in 8 bits each (common) $\rightarrow$ 16.7 million colors
  - RGB in 16 bits each $\rightarrow$ 281 trillion
  - Eye: 10 million colors

- Indexed color
  - color table
  - 8 bit index $\rightarrow$ RGB 24 bit
  - approximate using dithering
  - see “web safe colors”