

## Technical Info for Video 2:Time-Based Media

BFA course, spring 2009

Tuesday 8-11:50 am

# NOTES

WEEK 1

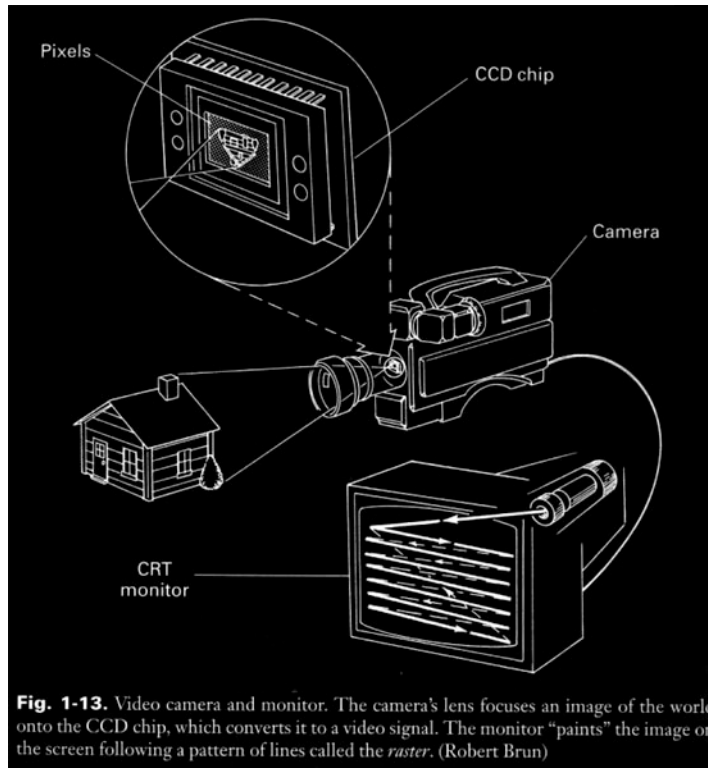
### Introduction

Video System – Analog Vs. Digital Video – Digital Camcorders  
- Settings – Digitizing - Compression methods.

## Video System

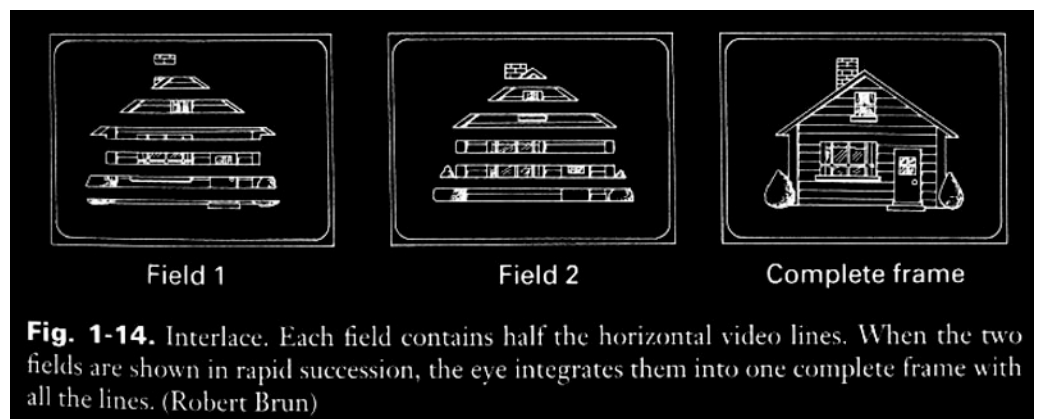
### The Camera and the Monitor

- Digital Video Cameras focus the image on CCD (Charge Couple Device), a light sensitive computer chip made of very tiny pixels grid.
- When a pixel is struck by light, it creates and stores an electric charge.
- The CCD reads the voltage of the charge many times a second and assigns it a specific intensity of RGB.
- This color signal can be recorded on a tape or displayed back on the TV screen.



## Monitor Display

- The Video System processes the image by dividing it into a number of Horizontal scan lines.
- Two fields form each frame; this process of forming picture on the TV monitor is called INTERLACED SCANNING.



## Broadcast Signals

- In North America, traditional broadcast Video systems use a standard developed by NTSC (National Television Standards Committee). NTSC Video uses 525 horizontal lines scanned in interlaced pattern. A new field is scanned 60 times a second. Since two fields make up one complete frame, this result in video that runs at about 30 frames a second.
- In U.K, Western Europe and China, the video standard used in called PAL (Phase Alternating Line). In France Eastern Europe and Russia, the SECAM (Systeme Electronique pour Couleur avec Memoire) is used. Both PAL and SECAM run at 25 fps and divide the picture in 625 horizontal scan lines. By using more lines than NTSC, these signals are capable of displaying a sharper image than NTSC.

## Color

- By combining different amounts of RED, GREEN and BLUE light, we can virtually create a light of any color.
- Color Video cameras render colors by breaking down the light coming into the camera lens into its RED, GREEN and BLUE components.
- In single chip camera, there are tiny filters on top of CCD to measure relative amounts of RED, GREEN and BLUE. In case of three chip cameras, a prism or mirror in the camera splits the light coming into the lens into RED, GREEN and BLUE paths and send it to the separate CCD.

## Analog versus Digital Video

- Until 1980, virtually all Video and audio production was done using analog tape recorders.
- The Electronics of Tape recording were never perfect.
- In Video, it showed up as grains and similarly in audio as background noise. Making dub of these tapes further degrades the quality.
- In Digital Recording, the Video or Audio signal represented by a set of numbers, which are, recorded as simple on-off

pulses. The information is robust and is not susceptible to any noise, even when you make generations of copies.

## Timecode

- Video production was revolutionized by the introduction of Timecode.
- Timecode is simply a means of electronically assigning a unique number or address to every frame of video. In United States, the standard professional system is SMPTE code (Society of Motion Pictures and Television Engineers).
- Timecode gives you ability to quickly locate any images and gives a crucial degree of control in video editing and image manipulation.

**01:00:10:14**

hours: minutes: seconds: frames

## Video Formats

- **VHS** (Video Home System) is a composite, analog format using 1/2 inch wide tape. In terms of image quality today, VHS is the worst format, with problems such as color bleeding specially with the red color. The resolution of VHS is 250 horizontal scan lines.
- **S-VHS** (Super Video Home System) has significantly improved quality with 400 horizontal scan lines and have Hi-fi sound tracks.
- **BETACAM** started a revolution in the field of video production. The Betacam format uses 1/2 inch cassette tape to record excellent analog component video image. BETACAM SP provides further improvement by using metal tape and allowing four audio tracks that are recorded along with the video signal.
- **DIGITAL BETACAM** format (also called Digi-Beta) provides a very high quality component digital signal and is used for both production and post-production. In terms of quality and Versatility Digi-Beta sets up the Broadcast Industry standard.

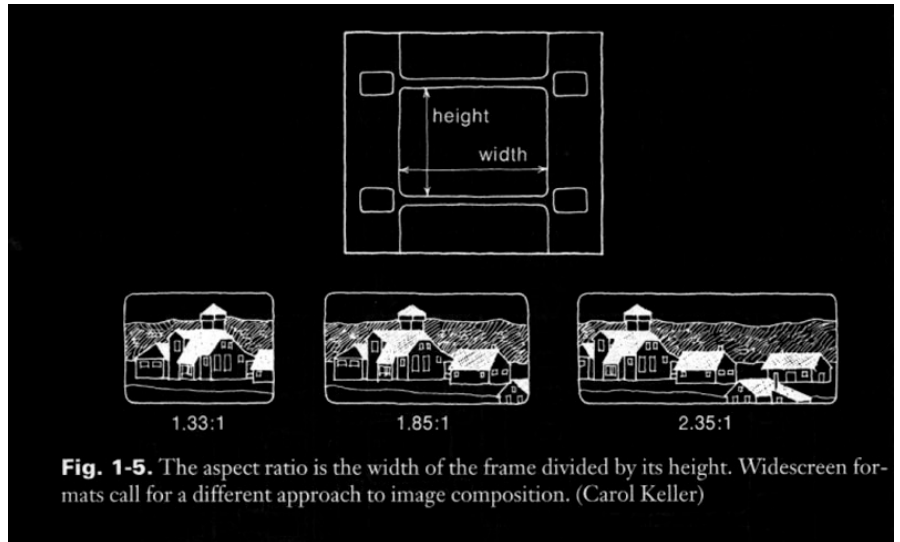
- **DV** (Digital Video) records an excellent digital component image on a very small tape cassette. DV has a resolution of about 500 scan lines. One of the innovations of DV is the use of Firewire (IEEE1394) cable. A Firewire allows a DV camera to connect with editing devices.
- **HDTV** (High- Definition Television, also called HD or Hi-Def) represented the holy grail of video quality. HD represents a quantum leap in resolution over traditional, analog systems and results in an image that rivals 35 mm film in clarity. One HD systems uses 1080 scan lines (more than twice NTSC's 525 – line raster) with an aspect ratio of 16:9. The result is an extremely sharp wide screen picture.
- **DVD** (Digital Video Disk) is a component video format with much-improved video and audio abilities, capable of over 500 lines of resolution. One 4-3/4-inch DVD can handle over two hours of compressed video with room for more than five high quality sound tracks. In terms of digital storage most of DVD-R disks can store 4.7 gigabytes of video and audio files.

## Digital Video Formats

- When importing a video in computer, make sure to save it as an uncompressed video file to make sure it remains lossless during the editing period.
- Compression comes into play when we export out the videos to match the desired file sizes. For example streaming a video for Internet has to be smaller in file size, so it has to be compressed.
- **MPEG** (Motion Picture Experts Group) Compression. **MPEG1** is designed for VHS quality. **MPEG2** is designed for playing full-screen higher quality video and DVD playback. **MPEG3** specifically addresses compression for Audio. **MPEG4** is designed for streaming videos on the Internet.
- The benchmark size of each frame of component video is 700kb per frame. Using DV compression, it comes down to about 1/5<sup>th</sup> of the size about 136 kb per frame for 720X480 pixels.

## Aspect Ratio and size

- The Television screen has an aspect ratio of 4:3 and a size of 640x480 in pixels. In case of wide screen NTSC supports 720x480 pixels.
- HDTV has an aspect ratio of 16:9 and has a size of 1280x720 in pixels.



**Fig. 1-5.** The aspect ratio is the width of the frame divided by its height. Widescreen formats call for a different approach to image composition. (Carol Keller)