

AN INTRODUCTION TO

DIGITAL MULTIMEDIA

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CHAPTER EIGHT

VIDEO

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MOVING PICTURES

- Film and video are a series of rapidly displayed still pictures.
 - Each image captures an instance of motion.
 - **Persistence of vision** results in perception of flow of motion.
- Analog **film** records images on transparent medium projected onto a screen.
- Analog **video** records images as continuously varying electrical voltages that produce images on a CRT or projection screen.

DIGITAL VIDEO CHALLENGES

- Large file sizes
 - Every second of uncompressed digital video requires 30MB of storage.
- Hardware performance
 - Computer processors, memory and bus size must deliver digital video to the screen at full motion frame rates.
- Distribution methods
 - DVD players.
 - High speed network bandwidth.

Digital video made possible by:

- Compression algorithms
- Fast computer hardware
- DVD storage
- Gigabit bandwidth.

DIGITAL VIDEO QUALITY

- Three factors contribute to quality.
 - Screen resolution
 - Number of horizontal and vertical pixels used to present the video image.
 - Frame rate
 - Number of individual video frames displayed per second.
 - Compression method
 - Algorithm used to compress and decompress the video.

Developers can adjust these factors to optimize delivery of digital video.

FRAME RATE

- Standard frame rate for broadcast video is 30 frames per second (Fps).
- Reducing the frame rate reduces the data to be transferred.
 - Video on Internet is often delivered at 15Fps.
- Cautions:
 - Lowering frame rate will slow delivery of individual images and drop out frames of video.
 - Result could be "jerky" motion.

15 Fps is a threshold for smooth motion video.

COMPRESS THE VIDEO

- Choosing compression depends on:
 - Output destination
 - DVD
 - Internet
 - Mobile device
 - Editing capability
 - Detailed editing tasks
 - Limited editing tasks
 - Type of images in video
 - Complex scenes
 - Similar scenes

COMMON VIDEO CODECS

- **MPEG**
 - MPEG-1(short videos on Video CD—optical disc format).
 - MPEG-4 (video over the web).
- **M-JPEG** (less-compressed higher quality files without inter-frame loss)
- **QuickTime** (cross-platform format supporting variety of codecs and screen resolutions)

COMMON VIDEO CODECS

- **Windows Media Video** (highly compressed streaming video format from Microsoft)
- **SDTV** (digital format that uses roughly same resolution as analog TV)
- **HDTV** (uses 16:9 aspect ration and progressing scanning)
- **AVCHD** (a variant of MPEG-4 compression recording at 1080i, 1080p, or 720p)
- **Motion JPEG 2000** (produces smaller files at higher quality, uses intra-frame compression, visually lossless, lossy or mathematically lossless compression).

DIGITAL VIDEO

SOURCES OF DIGITAL VIDEO

Convert existing analog video to digital.

Create or purchase digital footage.

ORIGINAL DIGITAL VIDEO

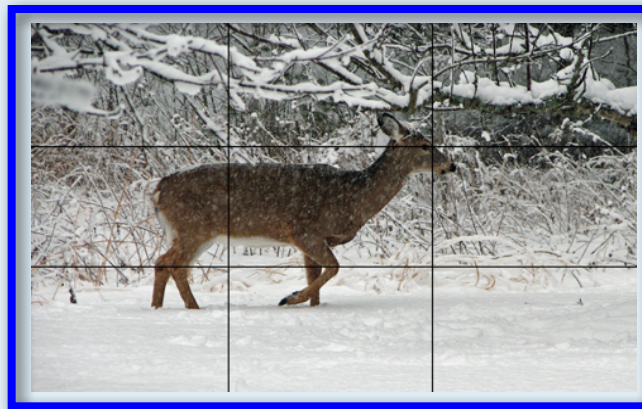
- Three main steps in creating original digital video:
 - Shooting
 - Editing
 - Rendering.

STEP ONE: SHOOTING

- Requires planning for:
 - Intended uses of video
 - List of shots required
 - Weather and lighting conditions
 - Availability of personnel
 - How the video will be integrated in the project.

SHOOTING BASICS

- Framing a Shot
 - **Rule of thirds**—widely embraced guideline for framing a video shot.
 - Preserves its interest.
 - Meaningfully relates it to action taking place.
 - Helps ensure adequate side and headroom.



SHOOTING BASICS

- Minimize camera motion.
 - Use tripod or steady surface to support camera.
 - Keep the camera still at all times.
- Camera controls for generating motion:
 - Pan—moving side to side.
 - Zoom—enlarge camera lens.

SHOOTING BASICS

- Take care of time code.
 - Format of **hours, minutes, seconds, frames**.
 - Time code becomes the frame address.
 - Editing software uses time code for splits, trims, transitions.
 - Camera records the code but
 - Code can be lost if user shifts to VCR mode to view video and advances to new location to continue shooting.
 - Look for camera's "End Search" control to restart code.
 - Less significant using optical & solid state recording formats.

SHOOTING BASICS

- Get the right shots.
 - Source video needs to cover all the important elements of the subject.
 - Videographer can use a variety of shots to tell the story.
 - Close up shot (CU)
 - Medium shot (MS)
 - Wide shot (WS)
 - Establishing shot
 - Cutaway
 - Point of view shot
 - Reverse angle shot
 - Over-the-shoulder shot

STEP TWO: EDITING

- Editing software options:
 - Consumer packages.
 - Prosumer applications.
 - Specialized video and film production.
- Features include:
 - Capture video from external source.
 - Arrange separate video clips.
 - Split and trim clips.
 - Add transitions and special effects.

RENDERING DECISIONS

- Choice of a codec.
 - All video must be compressed.
 - Choice will determine quality of resulting video.
 - Variable bit rate encoding better than constant bit rate.
- Choice of screen resolution.
 - Vary depending on mode of delivery:
 - DVDs = 720 X 480
 - CD media = 320 X 240
 - Web = 240 X180
 - Cell phones = 176 X 144.

GUIDELINES FOR VIDEO

- Shooting

- Choose camera carefully.
- Steady the camera.
- White balance prior to shooting.
- Avoid shooting into light and backlit scenes.
- Limit pans and zooms.
- Frame the subject.
- Make inventory of required shots.
- Use highest resolution available.
- Add external microphones.
- Use headphones to monitor sound quality.
- Record background sound for use in editing.
- Don't break the time code.