



Romel Cabiling ▾



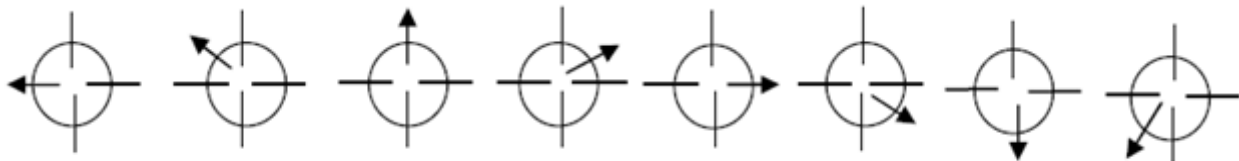
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## Lesson Proper for Week 5

### Principles of Animation

**Animation** is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement. It is an optical illusion of motion due to the phenomenon of persistence of vision, and can be created and demonstrated in a number of ways. The most common method of presenting animation is as a motion picture or video program, although several other forms of presenting animation also exist



Television video builds entire frames or pictures every second; the speed with which each frame is replaced by the next one makes the images appear to blend smoothly into movement. To make an object travel across the screen while it changes its shape, just change the shape and also move or *translate* it a few pixels for each frame.

### Types of Animation

- Traditional animation (cel animation or hand-drawn animation)
- Stop motion animation (Claymation, Cut-outs)
- Motion Graphics (Typography, Animated logo)
- Computer animation
- 2D animation



## Animation Techniques

When you create an animation, organize its execution into a series of logical steps. First, gather up in your mind all the activities you wish to provide in the animation; if it is complicated, you may wish to create a written script with a list of activities and required objects. Choose the animation tool best suited for the job. Then build and tweak your sequences; experiment with lighting effects. Allow plenty of time for this phase when you are experimenting and testing. Finally, post-process your animation, doing any special rendering and adding sound effects.

### Cel Animation

The term *cel* derives from the clear celluloid sheets that were used for drawing each frame, which have been replaced today by acetate or plastic. Cels of famous animated cartoons have become sought-after, suitable-for-framing collector's items.

Cel animation artwork begins with *keyframes* (the first and last frame of an action). For example, when an animated figure of a man walks across the screen, he balances the weight of his entire body on one foot and then the other in a series of falls and recoveries, with the opposite foot and leg catching up to support the body.

Ø The animation techniques made famous by Disney use a series of progressively different on each frame of movie film which plays at 24 frames per second.

Ø A minute of animation may thus require as many as 1,440 separate frames.

Ø The term cel derives from the clear celluloid sheets that were used for drawing each frame, which is been replaced today by acetate or plastic.

Ø Cel animation artwork begins with keyframes.

### Computer Animation

Computer animation programs typically employ the same logic and procedural concepts as cel animation, using layer, keyframe, and tweening techniques, and even borrowing from the vocabulary of classic animators. On the computer, paint is most often filled or drawn with tools using features such as gradients and antialiasing.

The word *links*, in computer animation terminology, usually means special methods for computing RGB pixel values, providing edge detection, and layering so that images can blend or otherwise mix their colors to produce special transparencies, inversions, and effects.

Ø Computer Animation is same as that of the logic and procedural concepts as cel animation and use the vocabulary of classic cel animation – terms such as layer, Keyframe, and tweening.

Ø The primary difference between the animation software program is in how much



must be drawn by the animator and how much is automatically generated by the software

Ø In 2D animation the animator creates an object and describes a path for the object to follow. The software takes over, actually creating the animation on the fly as the program is being viewed by your user.

Ø In 3D animation the animator puts his effort in creating the models of individual and designing the characteristic of their shapes and surfaces.

Ø Paint is most often filled or drawn with tools using features such as gradients and anti-aliasing.

### **Kinematics**

Ø It is the study of the movement and motion of structures that have joints, such as a walking man.

Ø Inverse Kinematics is in high-end 3D programs, it is the process by which you link objects such as hands to arms and define their relationships and limits.

Ø Once those relationships are set you can drag these parts around and let the computer calculate the result.

### **Morphing**

Ø Morphing is popular effect in which one image transforms into another. Morphing application and other modeling tools that offer this effect can perform transition not only between still images but often between moving images as well. The morphed images were built at a rate of 8 frames per second, with each transition taking a total of 4 seconds.

Ø Some product that uses the morphing features are as follows

- Black Belt's EasyMorph and WinImages,
- Human Software's Squizz
- Valis Group's Flo , MetaFlo, and MovieFlo.

### **Animation File Formats**

Some file formats are designed specifically to contain animations and the can be ported among application and platforms with the proper translators.

- Director                      \*.dir, \*.dcr
- AnimationPro                \*.fli, \*.flc
- 3D Studio Max                \*.max
- SuperCard and Director    \*.pics
- CompuServe                  \*.gif
- Flash                          \*.fla, \*.swf

Following is the list of few Software used for computerized animation:



Ø 3D Studio Max

Ø Flash

Ø AnimationPro

## **Video**

Moving images that have been captured or created electronically by a computer.

### **Characteristics of Video:**

#### **Analog**

A non-digital representation of information in a continuous flow, rather than as individual pieces of data

#### **Digital**

A representation of information as individual pieces of data

#### **Aspect Ratio**

Dimension of width to height

#### **Frame Rate**

Speed at which video frames appear; Measured in frames per second (fps)

## **Streaming**

process of transmitting audio/video files over the Internet that begin playing as the remaining data is temporarily transferring to your computer.

User friendly because video can be viewed as the file is loading without having to wait for the completed file to load.

### **Important Milestones:**

- 1986 – Professional digital video introduced
- 1990 – Quicktime format introduced as a consumer digital format by Apple computers
- 1995 – Professional and consumer digital videotape (DV) format released
- 1996 – DVD (Digital Video Disks) players introduced
- 1996 – WRAL-TV becomes the first television station to broadcast in HDTV (high definition television)
- 2009 – All television stations nationwide in the US began broadcasting exclusively in a digital format (DTV)



## **Analog versus Digital**

Digital video has supplanted analog video as the method of choice for making video for multimedia use. While broadcast stations and professional production and postproduction houses remain greatly invested in analog video hardware (according to Sony, there are more than 350,000 Betacam SP devices in use today), digital video gear produces excellent finished products at a fraction of the cost of analog. A digital camcorder directly connected to a computer workstation eliminates the image-degrading analog-to-digital conversion step typically performed by expensive video capture cards, and brings the power of nonlinear video editing and production to everyday users.

### **Digital Media is Used In:**

- ü **Education**
- ü **Information**
- ü **Entertainment**
- ü **Advertising**

### **Broadcast Video Standards**

Four broadcast and video standards and recording formats are commonly in use around the world: NTSC, PAL, SECAM, and HDTV. Because these standards and formats are not easily interchangeable, it is important to know where your multimedia project will be used.

#### **NTSC**

The United States, Japan, and many other countries use a system for broadcasting and displaying video that is based upon the specifications set forth by the 1952 National Television Standards Committee. These standards define a method for encoding information into the electronic signal that ultimately creates a television picture. As specified by the NTSC standard, a single frame of video is made up of 525 horizontal scan lines drawn onto the inside face of a phosphor-coated picture tube every 1/30th of a second by a fast-moving electron beam.

#### **PAL**

The Phase Alternate Line (PAL) system is used in the United Kingdom, Europe, Australia, and South Africa. PAL is an integrated method of adding color to a black-and-white television signal that paints 625 lines at a frame rate 25 frames per second.

#### **SECAM**

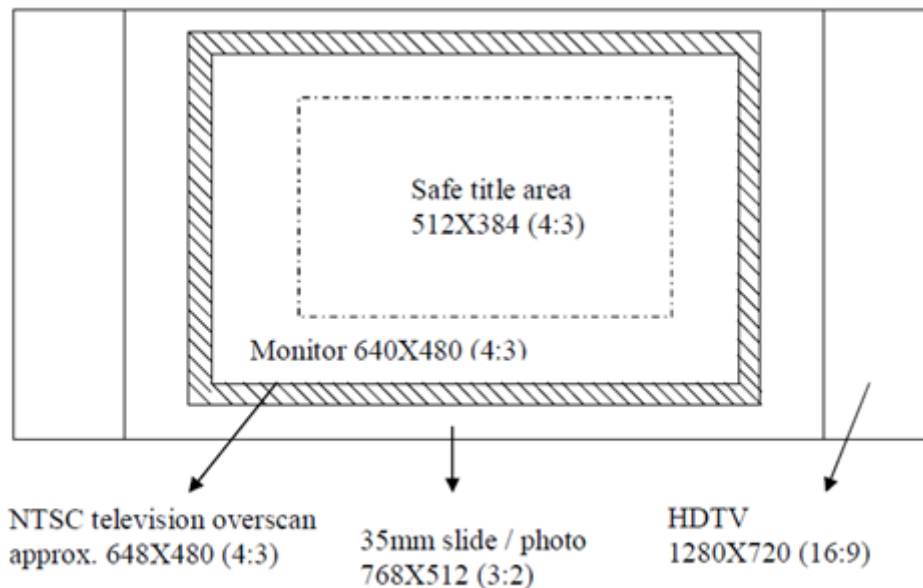
The Sequential Color and Memory (SECAM) system is used in France, Russia, and few other countries. Although SECAM is a 625-line, 50 Hz system, it differs greatly from



both the NTSC and the PAL color systems in its basic technology and broadcast method.

## HDTV

High Definition Television (HDTV) provides high resolution in a 16:9 aspect ratio (see following Figure). This aspect ratio allows the viewing of Cinemascope and Panavision movies. There is contention between the broadcast and computer industries about whether to use interlacing or progressive-scan technologies.



*Figure: Difference between VGA and HDTV aspect ratios*

## Shooting and Editing Video

To add full-screen, full-motion video to your multimedia project, you will need to invest in specialized hardware and software or purchase the services of a professional video production studio. In many cases, a professional studio will also provide editing tools and post-production capabilities that you cannot duplicate with your Macintosh or PC.

## Video Tips

A useful tool easily implemented in most digital video editing applications is “blue screen,” “Ultimate,” or “chromo key” editing. Blue screen is a popular technique for making multimedia titles because expensive sets are not required. Incredible backgrounds can be generated using 3-D modeling and graphic software, and one or more actors, vehicles, or other objects can be neatly layered onto that background. Applications such as VideoShop, Premiere, Final Cut Pro, and iMovie provide this capability.

## Recording Formats

### S-VHS video



In S-VHS video, color and luminance information are kept on two separate tracks. The result is a definite improvement in picture quality. This standard is also used in Hi-8. still, if your ultimate goal is to have your project accepted by broadcast stations, this would not be the best choice.

### **Component (YUV)**

In the early 1980s, Sony began to experiment with a new portable professional video format based on Betamax. Panasonic has developed their own standard based on a similar technology, called "MII," Betacam SP has become the industry standard for professional video field recording. This format may soon be eclipsed by a new digital version called "Digital Betacam."

### **Digital Video**

Full integration of motion video on computers eliminates the analog television form of video from the multimedia delivery platform. If a video clip is stored as data on a hard disk, CD-ROM, or other mass-storage device, that clip can be played back on the computer's monitor without overlay boards, videodisk players, or second monitors. This playback of digital video is accomplished using software architecture such as QuickTime or AVI, a multimedia producer or developer; you may need to convert video source material from its still common analog form (videotape) to a digital form manageable by the end user's computer system. So an understanding of analog video and some special hardware must remain in your multimedia toolbox.

Analog to digital conversion of video can be accomplished using the video overlay hardware described above, or it can be delivered direct to disk using FireWire cables. To repetitively digitize a full-screen color video image every 1/30 second and store it to disk or RAM severely taxes both Macintosh and PC processing capabilities—special hardware, compression firmware, and massive amounts of digital storage space are required.

### **Video Compression**

To digitize and store a 10-second clip of full-motion video in your computer requires transfer of an enormous amount of data in a very short amount of time. Reproducing just one frame of digital video component video at 24 bits requires almost 1MB of computer data; 30 seconds of video will fill a gigabyte hard disk. Full-size, full-motion video requires that the computer deliver data at about 30MB per second. This overwhelming technological bottleneck is overcome using digital video compression schemes or *codecs* (coders/decoders). A codec is the algorithm used to compress a video for delivery and then decode it in real-time for fast playback.

Real-time video compression algorithms such as MPEG, P\*64, DVI/Indeo, JPEG, Cinepak, Sorenson, ClearVideo, RealVideo, and VDOwave are available to compress





digital video information. Compression schemes use Discrete Cosine Transform (DCT), an encoding algorithm that quantifies the human eye's ability to detect color and image distortion. All of these codecs employ lossy compression algorithms. In addition to compressing video data, *streaming* technologies are being implemented to provide reasonable quality low-bandwidth video on the Web. Microsoft, RealNetworks, VxTreme, VDOnet, Xing, Precept, Cubic, Motorola, Viva, Vosaic, and Oracle are actively pursuing the commercialization of streaming technology on the Web.

QuickTime, Apple's software-based architecture for seamlessly integrating sound, animation, text, and video (data that changes over time), is often thought of as a compression standard, but it is really much more than that.

## **MPEG**

The MPEG standard has been developed by the Moving Picture Experts Group, a working group convened by the International Standards Organization (ISO) and the International Electro-technical Commission (IEC) to create standards for digital representation of moving pictures and associated audio and other data. MPEG1 and MPEG2 are the current standards. Using MPEG1, you can deliver 1.2 Mbps of video and 250 Kbps of two-channel stereo audio using CD-ROM technology. MPEG2, a completely different system from MPEG1, requires higher data rates (3 to 15 Mbps) but delivers higher image resolution, picture quality, interlaced video formats, multiresolution scalability, and multichannel audio features.

## **DVI/Indeo**

DVI is a property, programmable compression/decompression technology based on the Intel i750 chip set. This hardware consists of two VLSI (Very Large Scale Integrated) chips to separate the image processing and display functions.

Two levels of compression and decompression are provided by DVI: Production Level Video (PLV) and Real Time Video (RTV). PLV and RTV both use variable compression rates. DVI's algorithms can compress video images at ratios between 80:1 and 160:1. DVI will play back video in full-frame size and in full color at 30 frames per second.

## **Optimizing Video Files for CD-ROM**

CD-ROMs provide an excellent distribution medium for computer-based video: they are inexpensive to mass produce, and they can store great quantities of information. CDROM players offer slow data transfer rates, but adequate video transfer can be achieved by taking care to properly prepare your digital video files.

ü Limit the amount of synchronization required between the video and audio. With Microsoft's AVI files, the audio and video data are already interleaved, so this is not a necessity, but with QuickTime files, you should "flatten" your movie.





*Flattening* means you interleave the audio and video segments together.

- ü Use regularly spaced key frames, 10 to 15 frames apart, and temporal compression can correct for seek time delays. *Seek time* is how long it takes the CD-ROM player to locate specific data on the CD-ROM disc. Even fast 56x drives must spin up, causing some delay (and occasionally substantial noise).
- ü The size of the video window and the frame rate you specify dramatically affect performance. In QuickTime, 20 frames per second played in a 160X120-pixel window is equivalent to playing 10 frames per second in a 320X240 window. The more data that has to be decompressed and transferred from the CD-ROM to the screen, the slower the playback.

### **Common File Formats Include:**

#### **MOV (Movie)**

Developed by Apple computers for the Quicktime video player; Best used for streaming; Also known as Quicktime or movie format

#### **WMV (Windows Media Video)**

Developed by Microsoft for streaming video

#### **AVI (Audio Video Interleave)**

Developed by Microsoft for Windows media player;  
Not good for streaming

#### **MPEG-2 (Motion Picture Experts Group)**

Standard file format for DVD

### **Camera Movements:**

#### **Pan**

Camera remains stationary and the movement is from side to side (left and right)  
*Directions are "pan right" or "pan left"*

#### **Tilt**

Camera remains stationary and the movement is up and down  
*Directions are "tilt up" or "tilt down"*

#### **Truck**

Camera physically moves side to side (left and right)  
*Directions are truck right or truck left*

#### **Dolly**

Camera physically moves towards or away from the subject  
*Directions are "dolly in" or "dolly out"*

#### **Zoom**

Uses the mechanics of the camera lens to make the subject



appear closer

*Directions are “zoom in” or “zoom out”*

## **Camera Compositions:**

### **Rule of Thirds**

Mentally dividing the frame (what you see in the viewfinder) into thirds, both vertically and horizontally

Subject should occupy two thirds of frame (horizontally and vertically)

### **Close-Up**

Shot used to single out the more important part of the subject

Example – camera framing of a person’s face

### **Medium Shot (Mid Shot)**

Shot shows some part of the subject in more detail while still giving an impression of the whole subject

Example – camera framing of a person from waist up to top of head

### **Wide/Long Shot**

Shot shows subject and location in its entirety

Example – camera framing of a person from head to toe

### **High Angle Shot**

Shot composed by shooting the subject from above normal eye-level

High angle shots make the subject look small, weak, afraid, or dependent

### **Low Angle Shot**

Shot composed by shooting the subject from below normal eye-level

Low angle shots make the subject appear tall, powerful, commanding, strong or scary

## **Digital Video Equipment:**

- Computer
- Video Camera
- Microphones
- Tripods
- Lighting
- Recordable media
- Video switcher
- Cables/connectors





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