DIGITAL ANIMATION

2-D & 3-D Animation

2-D ANIMATION

- Produced by mimicking basic traditional techniques such as:
  - Flipbook technique
  - Cutout animation technique
  - Rotoscoping
  - Cel animation
- Paint/draw programs are used to create the components.
- Animation software can sequence, set timing, transitions, and produce the final animation.

DIGITAL CEL ANIMATION

- Animations are a series of individual frames.
  - Synchronized to one or more sound tracks.
  - Graphics arranged on layers.
  - Major changes identified in keyframes.
  - Illusion of motion produced as series of tweens.

ANIMATION SOFTWARE

- Elements of Flash organization.
  - Timeline: horizontal row of frames.
  - Frames: have multiple layers in columns.
    - Layers have stacking order (background elements on lower layers, changing elements on upper layers)
  - Keyframes: define major changes in a frame.
  - Tweens: frames created automatically by software.
  - Onionskinning: assists in drawing changes from one frame to the next.

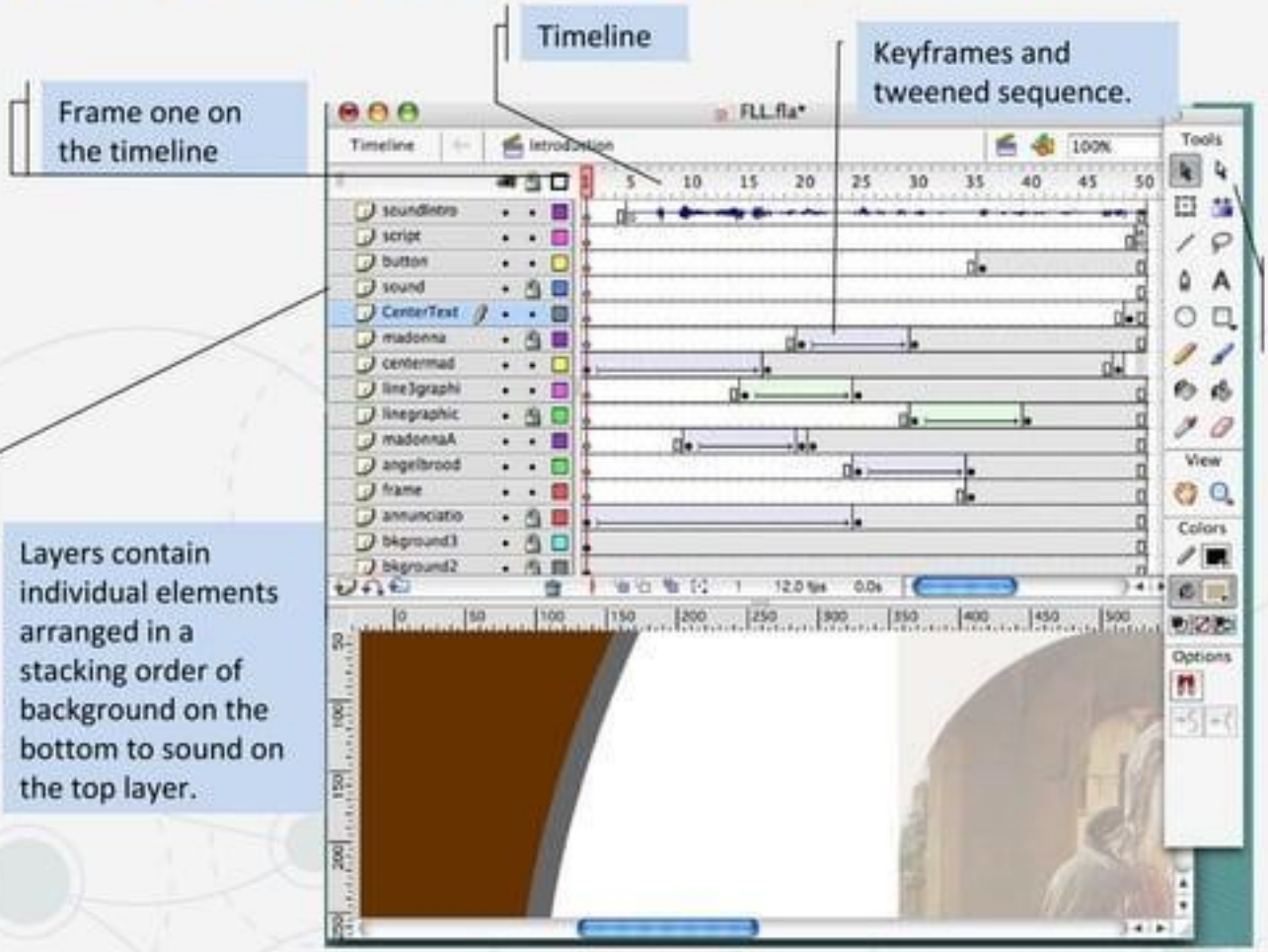
ANIMATION SOFTWARE

- Frame-by-frame animation: each frame is manually drawn to reflect motion sequence.
  - Gives detailed control of each motion.
  - Time consuming process.
- Tween animation: computer generates in-between frames based on two designated key frames.
  - Motion tween
  - Path-based tween
  - Shape tween (morphing)
  - Size tween
  - Color tween
  - Transparency tween

ANIMATION SOFTWARE

- Provide tools to support animation process.
  - Image-editing tools
  - Alignment tools and grids to control placement
  - Text tools
  - Basic sound control
  - Strategies to support interactivity.

FLASH DEVELOPMENT SCREEN



PROGRAMMED ANIMATION

- Animators write commands and the computer generates the animation.
  - Requires knowledge of programming and mathematical techniques to specify motion.
- Advantages:
  - File sizes are smaller.
  - Animations load and play faster.
  - Reduces bandwidth and processor demands.
  - Efficient creation of different versions of animated sequence.

PROGRAMMED ANIMATION

- Supports complex forms of interactivity.
  - Computer games take input from the user and animate the objects "on the fly."
- Scripting languages frequently used to generate programmed animations:
  - Lingo
  - Actionscript
  - Javascript

3-D ANIMATION

- Elements of 3-D animation set in motion include:
  - Objects
  - Sounds
  - Cameras
  - Lights.
- Techniques are similar to 2-D animation:
  - Key frame
  - Tween motion.
- Complex motion may involve using models of humans and animals.

MOTION CAPTURE

- Also called performance animation.
  - Technique of recording motion of actual objects and mapping these motions to a computer-generated animated character.
  - Performers have sensors to track the motion of various body parts as they create the action sequences.
- Used to capture complex natural motions that are difficult to create.

FORWARD KINEMATICS

- Kinematics is study of motion of bodies or systems of bodies.
  - The motion of one part generates related motion in others.
- Animator must adjust all motion in all related parts of the body.
  - Simple to implement.
  - Models easily defined.
  - Computer processing is minimal.
  - Quality of motion depends on animator's skill.
  - Animation is time consuming process.

INVERSE KINEMATICS

- Motion of one body part produces related motions in other body parts.
  - Simplifies animator's work and ensures consistent, realistic motion.
- Software embodies the knowledge of anatomical motion.
  - Requires innovative programming.
  - Demands more processing power than forward kinematics.
- Significantly reduces work of animator.

ANIMATING WITH PHYSICS

- Software can automatically generate motions based on properties of object and laws of physics.
- Will free animators from more tedious tasks of 3-D animation and produce more realistic content.
  - Animators can concentrate on developing stories and characters.

COMPLETING THE ANIMATION

- Rendering creates the final animation frames by applying:
  - The modeling
  - Surface definition
  - Scene composition as specified by animator

RENDERING OPTIONS

Shrek 1 in 2001 used about 5 million CPU render hours.

Shrek 2 in 2004 used 10 million CPU hours

Shrek 3 in 2007 used 20 million CPU hours.

- Pre-render
  - Requires enormous processing resources and time for animated movies.
  - Computer carries out complex calculations to implement the object properties, lighting, camera angles and motions.
- Render in real time
  - Computer produces animation immediately.
  - Used in video games and highly interactive 3-D animations.

ANIMATION TIPS & GUIDELINES

- Prepare for a learning curve.
  - Animation programs are more difficult to master.
- Design for delivery.
  - Minimize file size if delivery is for Web.
- Consider clip animation to reduce costs.
- Consult the tradition in developing motion.
  - Cycles, holds, shooting on twos, tweening, stretch and squash, ease in & ease out, overshoot & overlap motion are traditional techniques.